DEPARTMENT OF THE ENVIRONMENT

GOOD PRACTICE GUIDE 171

Energy efficiency primer

A Guide to help trade professionals, building material suppliers, and housing and energy advisers:

- become familiar with energy efficiency measures without having to be an expert
- advise customers who want to reduce fuel bills
- identify opportunities for installing energy efficiency measures during home improvement
- choose energy efficient solutions to building problems

BEST PRACTICE PROGRAMME

ENERGY EFFICIENCY

BEST PRACTICE PROGRAMME

GOOD PRACTICE GUIDE 171

About this Guide

ABOUT THIS GUIDE

This Guide has been produced by BRECSU as part of the Department of the Environment's Energy Efficiency Best Practice programme (EEBPp), in association with *Energy Efficiency*, an Energy Saving Trust partnership initiative.

Energy Efficiency is a new marketing initiative that will encourage consumers to buy energy efficient products, measures and services, by promoting them in a high-profile relevant way that appeals to a broad range of consumers. The Energy Saving Trust has created a strong *Energy Efficiency* brand that will signpost consumers to products and services that use less energy and save the consumer money.

The Energy Saving Trust is an independent government-funded body working in partnership with industry to develop the campaign.

BRECSU is an independent centre for information on energy efficiency in buildings, and manages the Department of the Environment's Energy Efficiency Best Practice programme for buildings.

This Guide has been published under two covers – the contents of which are the same.

The *Energy Efficiency* version, titled 'An essential Energy Efficiency guide to the home', is for use by organisations participating in the campaign, particularly installers who register as *Energy Efficiency* professionals and sign up to the *Energy Efficiency* Code of Practice. Retailers, local authorities and other advice providers participating may also use the *Energy Efficiency* version.

For details of how to become involved in the *Energy Efficiency* campaign contact the Energy Saving Trust at 11-12 Buckingham Gate, London, SW1E 5LB.

The Good Practice Guide, 'Energy efficiency primer' (GPG 171) is available to all installers, retailers, local authorities and other advisers under the Energy Efficiency Best Practice programme.

Further copies of the 'Energy efficiency primer' are available from BRECSU Enquiries Bureau. Tel 01923 664258.

Credits

The Guide is based on a concept developed by Projects In Partnership in collaboration with the EEBPp, the Energy Saving Trust, the London Borough of Croydon and Kirklees District Council.

This Guide has been developed in consultation with installers, trade organisations, builders' merchants, national home improvement/DIY retailers, local authority staff and Local Energy Advice Centres (LEACs).

BEST PRACTICE PROGRAMME

ENERGY EFFICIENCY

ENERGY EFFICIENCY

Contents

Introduction

PURPOSE OF THE GUIDE

This Guide is designed to help you deal with enquiries from clients about either home improvements or building problems.

In the case of home improvements energy efficiency measures can be cheaper if they are done at the same time as other work.

Where there are building problems there is the opportunity to use energy efficient solutions which will also reduce the client's fuel bills and improve comfort.

This Guide is for:

Trade professionals (opportunities for related energy efficiency work)

- plumbers
- heating installers
- insulators
- builders
- electricians.

Building materials suppliers (opportunities for related sales)

- staff at DIY stores
- counter staff at trade wholesalers.

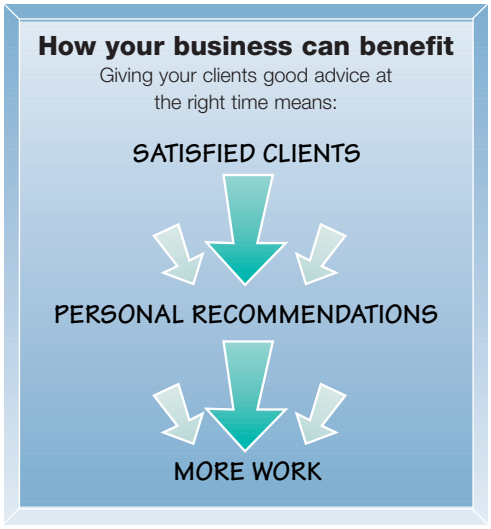
Housing and energy advisers (opportunities for related advice on energy efficiency)

- local authority housing managers
- environmental health officers
- building control officers
- property services managers
- Local Energy Advice Centre staff.

HOW THE GUIDE WILL HELP YOU

This Guide will help you to:

- become familiar with energy efficiency measures without having to be an expert
- advise clients who want to reduce their fuel bills but don't know how
- identify opportunities for installing energy efficiency measures at the same time as home improvements or repairs
- choose energy efficient solutions to building problems.



HOW THE GUIDE IS STRUCTURED

A Opportunities linked to home improvements or building problems (pages 4 and 5)

This section summarises the energy efficiency measures which can be considered when building improvements (page 4) or repairs (page 5) are being made. Some of these measures solve problems (eg condensation), others are cheaper and easier to do if done at the same time as other work (eg underfloor insulation).

KEY

rows	the type of improvement or repair
columns	the energy efficiency measures that can be considered
✓	likely to be the best options for improving comfort and energy efficiency

B Optional *Record sheet* (page 6)

This optional summary sheet can be used to enter details of the client's home and potential energy efficiency measures to consider. It can be used in conjunction with the *Action sheet* on page 41 to give the client details of the measures they could consider.

C Costs and benefits (pages 8-11)

This section gives a rough guide to the level of costs and the amount of savings you might expect for the energy efficiency measures in the range of average house types (detailed on page 8-11). These figures are very general and will be affected by a number of factors, eg house size, location etc.

Always recommend that the client obtains a range of quotes to get an accurate cost. Some savings will be taken as improved comfort rather than savings on the fuel bill.

D Measures (pages 12-40)

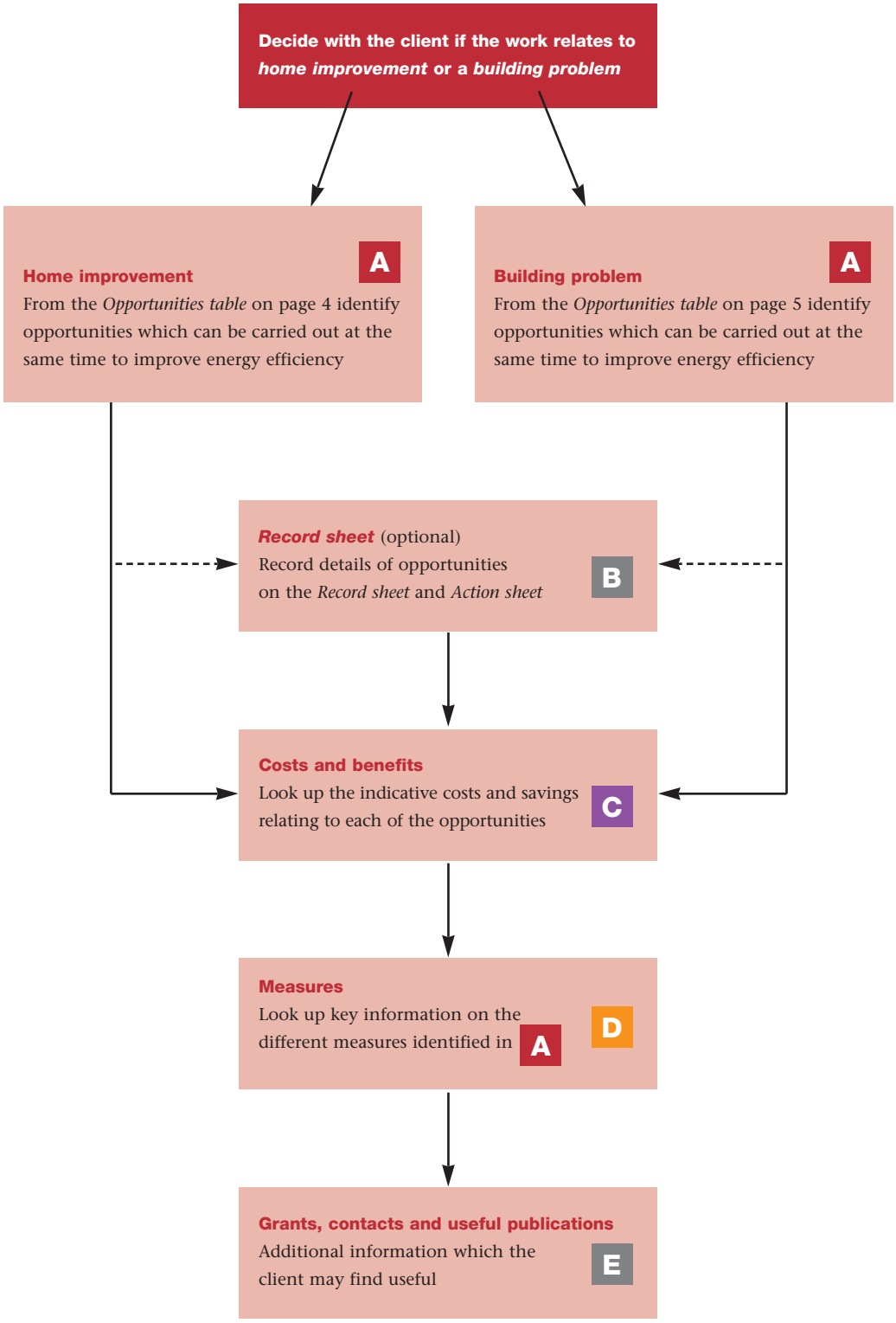
This section provides basic information that links the measures to the opportunities. Some simple guidance is also included, where appropriate. References relating to the measures are given for detailed guidance, if required.

Use the fold-in opportunities grid at the back for quick reference while using this section.

E Grants, contacts and useful publications (pages 42-44)

Some key grant sources are listed as well as contacts for further information.

Using the Guide with clients



A

Opportunities tables
pages 4 and 5
Use fold-in grid at the back for easy reference

B

Record sheet (optional)
page 6
If you need to record client's details

C

Costs and benefits
pages 8–11
Data for different house types

D

Measures
pages 12–40
Key information on measures, including things to bear in mind for each opportunity

E

Grants, contacts and useful publications
pages 41–44
Includes optional *Action sheet*

Opportunities

A

HOME IMPROVEMENTS

Energy efficiency measures	Wall insulation	Roof insulation	Floor insulation	Heating system	Hot water system	Controls	Draught-stripping	Controlled ventilation	Double glazing	Energy efficient lighting	Appliance labelling
Details on page	12	16	20	22	26	28	30	32	36	38	40
NEW WORK											
Moving into a new home	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Extension	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
Loft conversion		✓		✓	✓	✓		✓	✓	✓	
Nursery	✓	✓		✓		✓	✓	✓	✓	✓	
New kitchen	✓		✓	✓	✓	✓	✓	✓		✓	✓
New bathroom	✓			✓	✓	✓	✓	✓			
New heating	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Conservatory	✓		✓				✓	✓	✓		
MAINTENANCE											
Re-roofing		✓						✓			
Replacement windows							✓	✓	✓		
Re-wiring		✓	✓	✓	✓	✓	✓			✓	
Re-flooring			✓	✓			✓	✓			
Replacement boiler				✓	✓	✓	✓	✓			
Redecorating	✓						✓	✓	✓	✓	
Re-rendering externally	✓								✓		

✓ *These boxes show the opportunities for energy efficiency measures to be installed at the same time as other work is being done.*

✓ *These boxes show what are likely to be the best opportunities for improving comfort and energy efficiency.*

IMPORTANT NOTES

- All energy efficiency measures may be worth considering.
- Some home improvements are subject to statutory regulations which set minimum standards.

USING THE CHART

Step 1 If your client is planning a home improvement measure, look at the left hand column for the job most like the one your client is going to have done.

Step 2 Read across the chart to see which energy efficiency measures could be carried out at the same time as other work (shown by ✓).

Step 3 Make a note of the potential measures, or tick them off on a copy of the *Record sheet* on page 6 (a blank copy for photocopying, if necessary, is provided at the back of this Guide).

Opportunities

BUILDING PROBLEMS

Energy efficiency measures	Wall insulation	Roof insulation	Floor insulation	Heating system	Hot water system	Controls	Draught-stripping	Controlled ventilation	Double glazing	Energy efficient lighting	Appliance labelling
Details on page	12	16	20	22	26	28	30	32	36	38	40
High fuel bills	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Poor heating	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Insufficient hot water				✓	✓	✓					
Cold rooms	✓	✓	✓	✓		✓	✓	✓	✓		
Too draughty							✓	✓	✓		
Too stuffy						✓		✓			
Musty rooms	✓	✓	✓	✓		✓	✓	✓			
Condensation	✓	✓	✓	✓		✓	✓	✓	✓		
Penetrating/ rising damp	✓		✓				✓	✓			
Burst pipes and leaks		✓	✓	✓	✓	✓	✓				
Wet or dry rot	✓	✓	✓				✓	✓			
Rotten windows							✓	✓	✓		
Noise							✓	✓	✓		

✓ *These boxes show which energy efficient measures could help solve the problem, or be installed at the same time as remedial work is being done.*

✓ *These boxes show what are likely to be the best opportunities for improving comfort and energy efficiency.*

USING THE CHART

Step 1 If your client has a building problem (eg condensation), look at the left hand column for the problem most like your client's.

Step 2 Read across the chart to see which energy efficiency measures could help solve the problem, and save energy or improve comfort at the same time (shown by ✓).

Step 3 Make a note of the potential measures, or tick them off on a copy of the *Record sheet* on page 6 (a blank copy for photocopying, if necessary, is provided at the back of this Guide).

A

Record Sheet

OPPORTUNITIES AND POSSIBLE MEASURES

B

Copy this page (or use one of the spare copies provided at the back of this Guide)

Energy efficiency measures	Potential measures (tick from pages 4 and 5)	Details of potential measures (page)	Brief details of the client's home and its services (fill in details if known)		Possible measures to consider (tick possible measures, taking into account the details of the home)	
Wall insulation		12	Cavity wall		**Cavity wall insulation**	
			Solid wall		**Solid wall insulation**	
			Timber frame wall		NONE – will already be well insulated	
Roof insulation		16	Existing insulation thickness	mm	**Roof insulation**	mm
Floor insulation		20	Solid floor		**Floor insulation**	
			Floorboards			
Heating system		22	Wet central system – age of system	yrs	**Wet central heating system**	
			Other system		**Other heating system**	
			Fuel used	gas		
Hot water system		26	From central heating		**Hot water system**	
			Independent			
Controls		28	Time and temperature controls		**Heating and hot water controls**	
Draughtstripping		30	To all external doors		**Draughtstripping**	
			To all windows			
Controlled ventilation		32	Extract fan in kitchen		**Ventilation control**	
			Extract fan in bathroom			
Double glazing		36	Double glazed windows with sealed units		**Double glazing**	
			Secondary double glazing			
Low energy lighting		38	Fluorescent light in kitchen		**Low energy lighting**	
			Low energy lamps in other rooms			
Appliance labelling		40	All appliances are low energy models		**Low energy appliances**	

TYPE 1	Detached house or Bungalow	☐	(see page 7 for house types)
TYPE 2	Semi-detached house or End-of-terrace	☐	
TYPE 3	Mid-terraced house	☐	
TYPE 4	Flat	☐	

House types

TYPE 1 Detached house or Bungalow p8

TYPE 2 Semi-detached house or End-of-terrace p9

TYPE 3 Mid-terraced house p10

TYPE 4 Flat p11

USING INFORMATION ON HOUSE TYPES

Step 1 Use the pictures to decide which house type is most like your client's home.

Step 2 Tick the type at the bottom of the *Record sheet* on page 6.

Step 3 Use the house type to find the right cost benefit table on pages 8 to 11.

B

Cost benefit

C

TYPE 1

eg Detached house or bungalow

Page	MEASURE	WHOLE HOUSE						PARTIAL WORKS
			INSTALLER			DIY		
		Saving (£/yr)	Cost (£) from Total	Cost (£) from Marginal*	Payback (yrs) from	Cost (£) from	Payback (yrs) from	
13	Cavity wall insulation	75-150	550		3-4			
14	Solid wall insulation (external)	100-200		1900	9-10			
15	Solid wall insulation (internal)	100-175	1200		6-7	800	4-5	✓
16	Roof insulation	45-65	350		5	100	1-2	✓
20	Floor insulation	20-40		300	7-8	100	2-3	✓
23	Replacement condensing boiler	150		300	2			
27	Hot water insulation package	approx. 20	35		2			
28	Full heating controls package	80-100	300		3			
30	Draughtstripping	15-30	200		6-7	80	2-3	✓
36	Double glazing	25-50		200	4	200	4	✓
38	Lighting (x 4 lamps)	35-45				approx. 40	1	✓

** Marginal cost is the additional cost of adding an energy efficient option to work already being undertaken; eg the difference between replacement single glazing and double glazing. Payback shows how long it will take to recover the cost of the measure through savings on fuel. Some measures need not be 'whole house' (partial works); costs and savings will therefore be lower.*

The figures in this table are only an indication of costs; actual quotations could be higher or lower.

(Figures are based on December 1996 prices.)

NOTES

- The costs and savings figures will vary according to the size of the house, its location, the measure (if appropriate), fuel, heating system and the materials used.
- Energy savings are estimated from a range of standard house types with gas heating and a standard occupancy. Actual savings depend on individual circumstances. Remember that some of the benefit may be taken in improved comfort.
- DIY costs are for these measures where an average level of DIY skill is required. If in doubt about any aspect of the installation skills required, consult an appropriately qualified person.

Cost benefit

TYPE 2

eg Semi-detached or end-of-terrace

Page	MEASURE	WHOLE HOUSE						PARTIAL WORKS
			INSTALLER			DIY		
		Saving (£/yr)	Cost (£) from Total	Cost (£) from Marginal*	Payback (yrs) from	Cost (£) from	Payback (yrs) from	
13	Cavity wall insulation	75-150	400		4			
14	Solid wall insulation (external)	85-120		1500	12-13			
15	Solid wall insulation (internal)	75-100	650		6-7	450	4-5	✓
16	Roof insulation	35-45	200		4-5	75	1-2	✓
20	Floor insulation	15-30		250	8	75	approx. 2	✓
23	Replacement condensing boiler	100-120		300	2-3			
27	Hot water insulation package	approx. 10	35		3-4			
28	Full heating controls package	60-80	300		4-5			
30	Draughtstripping	15-25	150		6	50	2	✓
36	Double glazing	25-30		170	5-6	200	6-7	✓
38	Lighting (x 4 lamps)	approx. 35				approx. 40	approx. 1	✓

** Marginal cost is the additional cost of adding an energy efficient option to work already being undertaken; eg the difference between replacement single glazing and double glazing. Payback shows how long it will take to recover the cost of the measure through savings on fuel. Some measures need not be 'whole house' (partial works); costs and savings will therefore be lower.*

The figures in this table are only an indication of costs; actual quotations could be higher or lower.

(Figures are based on December 1996 prices.)

NOTES

- The costs and savings figures will vary according to the size of the house, its location, the measure (if appropriate), fuel, heating system and the materials used.
- Energy savings are estimated from a range of standard house types with gas heating and a standard occupancy. Actual savings depend on individual circumstances. Remember that some of the benefit may be taken in improved comfort.
- DIY costs are for these measures where an average level of DIY skill is required. If in doubt about any aspect of the installation skills required, consult an appropriately qualified person.

C

TYPE 3

eg Mid-terraced house

Page	MEASURE	WHOLE HOUSE						PARTIAL WORKS
			INSTALLER			DIY		
		Saving (£/yr)	Cost (£) from Total	Cost (£) from Marginal*	Payback (yrs) from	Cost (£) from	Payback (yrs) from	
13	Cavity wall insulation	approx. 50	350		7			
14	Solid wall insulation (external)	approx. 50-60		800	13-14			
15	Solid wall insulation (internal)	approx. 50	400		8	300	6	✓
16	Roof insulation	35-40	180		4-5	70	2	✓
20	Floor insulation	approx. 15		250	16-17	70	4-5	✓
23	Replacement condensing boiler	75-100		300	3			
27	Hot water insulation package	approx. 10	35		3-4			
28	Full heating controls package	50-65	300		4-5			
30	Draughtstripping	15-20	150		7-8	50	2-3	✓
36	Double glazing	approx. 25		100	4	120	approx. 5	✓
38	Lighting (x 4 lamps)	approx. 25				approx. 30	approx. 1	✓

** Marginal cost is the additional cost of adding an energy efficient option to work already being undertaken; eg the difference between replacement single glazing and double glazing. Payback shows how long it will take to recover the cost of the measure through savings on fuel. Some measures need not be 'whole house' (partial works); costs and savings will therefore be lower.*

The figures in this table are only an indication of costs; actual quotations could be higher or lower.

(Figures are based on December 1996 prices.)

NOTES

- The costs and savings figures will vary according to the size of the house, its location, the measure (if appropriate), fuel, heating system and the materials used.
- Energy savings are estimated from a range of standard house types with gas heating and a standard occupancy. Actual savings depend on individual circumstances. Remember that some of the benefit may be taken in improved comfort.
- DIY costs are for these measures where an average level of DIY skill is required. If in doubt about any aspect of the installation skills required, consult an appropriately qualified person.

Cost benefit

TYPE 4

Flat

Page	MEASURE	WHOLE HOUSE						PARTIAL WORKS
			INSTALLER			DIY		
		Saving (£/yr)	Cost (£) from Total	Cost (£) from Marginal*	Payback (yrs) from	Cost (£) from	Payback (yrs) from	
13	Cavity wall insulation							
15	Solid wall insulation (internal)	35-40	400		10	300	7-8	✓
16	Roof insulation (top floor only)	approx. 65	275		4	100	1-2	✓
20	Floor insulation (ground floor only)	20		275	13-14	100	5	✓
23	Replacement condensing boiler	50-60		300	5			
27	Hot water insulation package	approx. 10	35		3-4			
28	Full heating controls package	25-35	300		8-9			
30	Draughtstripping	10-15	100		6-7	35	2-3	✓
36	Double glazing	10-15		100	6-7	75	5	✓
38	Lighting (x 4 lamps)	approx. 25				approx. 30	approx. 1	✓

** Marginal cost is the additional cost of adding an energy efficient option to work already being undertaken; eg the difference between replacement single glazing and double glazing. Payback shows how long it will take to recover the cost of the measure through savings on fuel. Some measures need not be 'whole house' (partial works); costs and savings will therefore be lower.*

The figures in this table are only an indication of costs; actual quotations could be higher or lower.

(Figures are based on December 1996 prices.)

NOTES

- The costs and savings figures will vary according to the size of the house, its location, the measure (if appropriate), fuel, heating system and the materials used.
- Energy savings are estimated from a range of standard house types with gas heating and a standard occupancy. Actual savings depend on individual circumstances. Remember that some of the benefit may be taken in improved comfort.
- DIY costs are for these measures where an average level of DIY skill is required. If in doubt about any aspect of the installation skills required, consult an appropriately qualified person.

Wall insulation

ALL INSULATION METHODS

EFFECTIVENESS

- Most of the heat lost from a typical two-storey detached house is through the external walls.
- Wall insulation can reduce heat loss through the wall by up to 80%.
- Wall insulation is, therefore, one of the first measures to consider. The opportunities and costs depend very much on the type of wall.
- 96% of householders with cavity walls would be likely to install it in their next property if technically possible.

TYPES OF WALL

There are three main types of wall:

- cavity masonry wall
- solid masonry wall
- timber frame wall.

Most timber frame walls are already well insulated and should need no extra insulation. Whenever possible, the opportunity should be taken to insulate cavity and solid walls. Cavity walls are easier to insulate than solid walls.

Things to bear in mind about wall insulation

HOME IMPROVEMENTS

Moving into a new home	Install in conjunction with major renovation/redecoration
Extension	A good time to insulate more than required by Regulations
Loft conversion	
Nursery	When redecorating, consider internal insulation
New kitchen	Insulate internally when part of major refurbishment
New bathroom	
New heating system	Insulate to reduce the size of the heating system needed
Conservatory	Insulate dwarf walls and the dividing wall with the house

Re-roofing	
Replacement windows	
Re-wiring	
Re-flooring	
Replacement boiler	
Redecorating	Insulate internally if major redecorating is needed
Re-rendering	Most cost-effective time to insulate externally

BUILDING PROBLEMS

High fuel bills	Insulation can lower fuel costs
Poor heating	Insulation improves heating performance
Insufficient hot water	

Cold rooms	Insulation can make rooms more comfortable
Too draughty	
Too stuffy	
Musty rooms	Insulation, in conjunction with heating and controlled ventilation, prevents condensation and mould
Condensation	

Penetrating/ rising damp	Incorporate insulation in remedial measures
Burst pipes and leaks	
Wet or dry rot	Incorporate insulation in remedial work
Rotten windows	

Noise	

★ Heat loss is significantly reduced

★ Comfort is greatly increased

IMPORTANT NOTES

- Wall insulation, in conjunction with adequate heating and controlled ventilation, is effective in preventing condensation and mould growth.
- When adding a conservatory, the walls dividing it from the house should be insulated as well as any dwarf walls to the conservatory itself.
- Insulation should be carried out either before, or at the same time as, installing a new heating system, because the reduced heat loss should make it possible to have a smaller, and therefore cheaper, heating system.

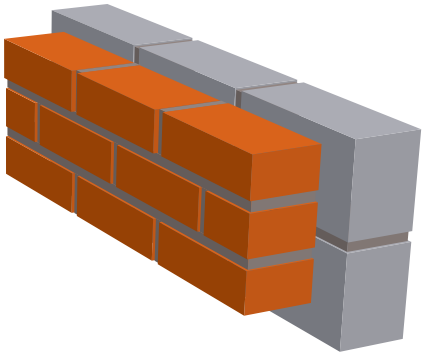
D

Wall insulation

CAVITY WALL INSULATION

Cavity fill is a very cost-effective insulation measure

HOW TO SPOT A CAVITY WALL



A brick cavity wall usually has all the bricks placed lengthways. It has a total thickness of about 300 mm.

PRE-INSTALLATION INSPECTION

- Essential to assess walls for suitability.
- Any defects should be put right before work begins.
- Dampness problems must be identified and rectified.

INSTALLATION

- The materials are injected or blown into the cavity, usually from the outside through holes drilled between the brick courses.
- The work should be done only by specialist contractors.

GUARANTEES

- The contractor should always offer a CIGA guarantee – the industry-wide scheme (see Contacts on page 43).

MATERIALS

Blown mineral wool

- can be used in any exposure zone
- is covered by a British Board of Agrément (BBA) certificates

Urea-formaldehyde foam (UF)

- is covered by British Standards BS 5618 and BS 5617 for the material and its application
- not generally recommended where the occupants have respiratory diseases.

Polystyrene beads or granules

- expanded polystyrene (EPS) in the form of beads or granules may be loose, or stuck together with a resin so that they stay in place
- covered by British Board of Agrément (BBA) certificates.

- The suitability for filling walls in all weather exposures depends on the masonry materials used, the pointing and the insulation material (see Good Practice Guide 26 for further details, including a map and definitions of exposure zones).
- Timber framed walls (even those with masonry on the outside) should not be filled.
- Walls painted with low permeability finishes can have an increased risk of frost damage when filled.
- Concrete lintels and sills that extend across the cavity (thermal bridges) may need to be insulated internally to avoid the risk of surface condensation (see Good Practice Guide 26).

IMPORTANT NOTES

- Most cavity walls, especially those built after 1930, can be filled. The work usually takes less than a day.
- It can be done at any time and the occupants can stay at home during the installation.
- Best practice recommends that if the cavity contains PVC-covered electrical cables, it should not be insulated unless the cables are removed.
- Walls with cavities less than 50 mm wide are not recommended for filling.

REFERENCES

GPG 26
'Cavity wall insulation in existing housing'
GPG 155
'Energy efficient refurbishment of existing housing'
GIL 23
'Cavity wall insulation: Unlocking the potential in existing buildings'
GPCS 63, 64 and 66
see bibliography for details

D

Wall insulation

SOLID WALL INSULATION – EXTERNAL

Solid wall insulation is worth considering if the exterior needs repair or if major internal renovation is planned

EFFECTIVENESS

External wall insulation

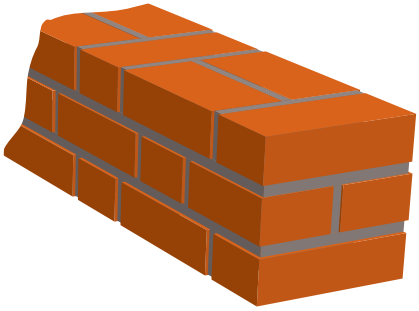
- can prevent damp penetration
- cost-effective if it avoids the need to carry out remedial work to the outside of the wall or if remedial work is being done anyway
- room surfaces heat up slowly, so better for houses heated all day.

External insulation

- has a long payback period if not done in conjunction with remedial work to the wall
- some finishes may be vulnerable to impact damage
- has fewer problems of thermal bridging than internal insulation.

HOW TO SPOT A SOLID WALL

Solid walls are mainly of brick or stone. Some solid brick walls can be recognised by the pattern of the brickwork – the bricks are placed both head on and lengthways. Thickness is usually about 225 mm. As a rule-of-thumb most pre-1930 housing will have solid walls.



EXTERNAL WALL INSULATION

- External insulation is a composite system consisting of insulation material protected by render, cladding or hung tiles.
- The work should be done by a specialist installer.
- Systems with a British Board of Agrément (BBA) certificate are recommended. The External Wall Insulation Association (EWIA) (see Contacts, page 43) holds a register of proven systems and installers.
- The surface finish is thick, so care is needed at window sills, rainwater downpipes and where the wall meets the roof. The specialist installer will have ways of dealing with these junctions.

Comfort is greatly increased

IMPORTANT NOTES

External insulation

- may need planning permission if the external appearance is changed dramatically
- does not disrupt the occupants.

COMMON QUESTIONS

I live in a conservation area – how will that affect me ?

You may not be allowed to change the appearance of your outside walls by adding external wall insulation. Check with your planning office.

D

SOLID WALL INSULATION – INTERNAL

INTERNAL WALL INSULATION

- Internal wall insulation consists of insulation behind a layer of plasterboard (insulated dry lining).
- Before starting work, a detailed inspection for wet and dry rot should be made and any problems put right.
- Internal insulation can take the form of a composite 'thermal board' or a built-up system using insulation between timber battens.

THERMAL BOARD

- This is a composite board made of plasterboard with a backing of insulation and a built-in vapour control layer (to prevent moisture passing through the board and condensing on the cold masonry).
- Thermal boards use a variety of insulants, eg polystyrene, urethane and mineral wool, and are normally between 25 and 50 mm thick.
- The thicker the board, the better the insulation.

INSULATION BETWEEN BATTENS

- Insulation is fixed between timber battens and covered with plasterboard.
- There is no built-in vapour control layer, so a polythene sheet is installed between the plasterboard and the insulation as a vapour check before the plasterboard is fixed to the battens.

EFFECTIVENESS

Internal wall insulation

- cheaper than external insulation but more disruptive
- most cost-effective when done as part of major renovation, when kitchen units, sanitary fittings and radiators are removed
- room surfaces heat up quickly, so better for houses heated only morning and evening.

Internal insulation

- all edges must be properly sealed to stop moisture in the room air condensing on the cold wall behind the insulation
- additional insulation may be needed to avoid problems from thermal bridging (see Good Practice Guide 138).

Internal insulation

- slightly reduces the floor area of rooms
- disrupts occupants, so best done in conjunction with other work
- door and window mouldings, skirting boards, and electrical sockets need to be removed and replaced on top of the plasterboard afterwards.

COMMON QUESTIONS

Can I still put up pictures and shelves on walls if they are insulated internally ?

Light items (eg small pictures) can be supported from the plasterboard using specially adapted fixings (available from DIY and builders' merchants). Heavy pictures, mirrors or shelves should be fixed into the wall behind the insulation.

REFERENCES

GPG 138

'Internal wall insulation in existing housing'

see bibliography

D

Roof insulation

ALL ROOF TYPES

EFFECTIVENESS

- Loft insulation can reduce annual heating costs on most house types by up to 20%.
- It is a very cost-effective measure, even if you have some insulation already and are just topping up.

WHEN TO DO IT

- Loft insulation can be done at any time, whereas attic and flat roof insulation is best done when other work needs to be done to the roof.

TYPES OF ROOF

The main types of roof are:

- pitched roofs with lofts
- pitched roofs with attic rooms
- flat roofs.

Lofts are the easiest to insulate. Attic rooms and flat roofs in existing houses can be insulated, but the work is best done along with a conversion or major renovation.

Things to bear in mind about roof insulation

HOME IMPROVEMENTS

Moving into a new home	Top up loft insulation if there is less than 100 mm
Extension	A good time to add insulation to the main part of the house
Loft conversion	A good time to add insulation to inaccessible spaces
Nursery	Top up loft insulation if there is less than 100 mm
New kitchen	
New bathroom	
New heating system	Insulate to reduce the size of the heating system needed
Conservatory	

Re-roofing	Top up roof insulation and insulate inaccessible spaces
Replacement windows	
Re-wiring	Top up roof insulation when replacing electrical cables
Re-flooring	
Replacement boiler	
Redecorating	
Re-rendering	

BUILDING PROBLEMS

High fuel bills	Insulation can reduce fuel bills
Poor heating	Insulation improves heating performance
Insufficient hot water	

Cold rooms	Insulation can make rooms more comfortable
Too draughty	
Too stuffy	
Musty rooms	Insulation, in conjunction with heating and controlled ventilation, prevents condensation and mould
Condensation	

Penetrating/ rising damp	
Burst pipes and leaks	Top up roof insulation and lag all pipes and cisterns
Wet or dry rot	Top up roof insulation if remedial work required
Rotten windows	

Noise	

Loft insulation is highly cost-effective

IMPORTANT NOTES

- Roof insulation, in conjunction with wall insulation, adequate heating and controlled ventilation, is effective in preventing condensation and mould growth.
- Insulation should be carried out either before or at the same time as installing a new heating system, because the reduced heat loss should make it possible to have a smaller, and therefore a cheaper, heating system.

Roof insulation

PITCHED ROOFS WITH LOFTS

Loft insulation is the easiest and most cost-effective energy efficiency measure

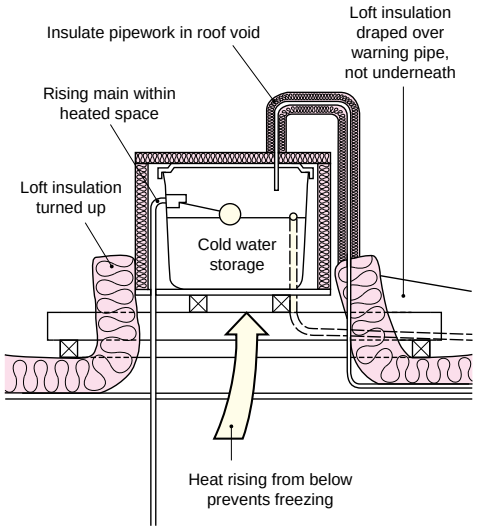
INSTALLATION

- Insulation is laid between and over the ceiling joists in the loft space to a depth of 200 mm.
- The material is installed either by rolling out insulation quilt or by blowing loose fill materials.

MATERIALS

Mineral wool quilts

- readily available, can be installed by DIYer
- should be in two layers – one between and the other across the joists – to be most effective
- take care not to compress insulation when tucking it into tight spaces
- covered by BS 5803 parts 1 and 5.



Cold water cistern and pipe insulation

All loose fill products

- useful where access is difficult, eg low pitched roofs and dormers
- easily topped up
- installation by a specialist contractor is recommended – the NALIC (see Contacts, page 43) has a register of approved contractors.

Blown mineral wool

- access to the water tanks and the loft hatch should be boarded to avoid disturbing loose materials
- covered by BS 5803 parts 2 and 5.

Blown cellulose fibre

- makes use of readily available recycled paper
- covered by British Standard BS 5803 parts 3 and 5.

IMPORTANT NOTES

- Extra insulation makes the loft space **colder** than before, so all water tanks and pipes in the loft must be insulated.
- The loft hatch should be insulated and draughtstripped at the same time – or a proprietary insulated access hatch used.
- If there is already 150 mm of insulation in the loft, it is not worth adding more – if there is already 100 mm between the joists, it is worthwhile adding another 100 mm across the joists.
- All holes at ceiling level should be filled, especially where pipes pass through into the loft from the bathroom and the airing cupboard. This prevents moist air condensing on cold surfaces in the loft.

- Loft insulation can usually be carried out by the householder, but it is recommended that protective clothing (mask, rubber gloves, overalls) be worn because the fibres can irritate the skin.
- If insulation hides the joists, a safe walkway (eg from the loft hatch to the water tanks) must be created by laying boarding on extra timbers running across the joists.
- Ventilation openings into the loft from the eaves should not be blocked by the insulation.
- If electricity cables are being renewed, they should run above the insulation to avoid overheating.
- Do not insulate below water tanks, but make sure the loft insulation is continuous with the tank insulation.
- Avoid putting recessed light fittings in the ceiling to the loft, as they cannot be sealed.

D

Roof insulation

PITCHED ROOFS WITH ATTIC ROOMS

WHEN TO DO IT

- when the loft is being converted
- any time, if access is available.

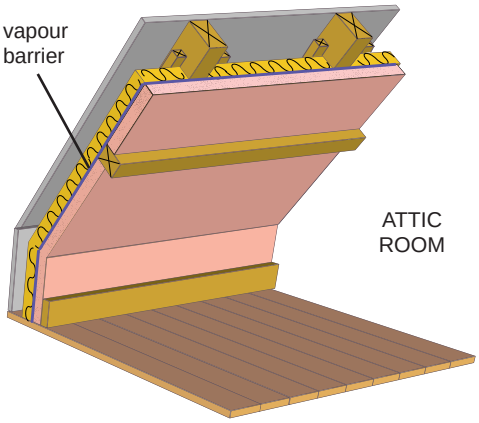
Attic insulation is cost-effective for a room-in-the-roof if the roof covering is being replaced when converting a loft

INSTALLATION

- Attics can be insulated from inside (ventilated roof) or from outside (sarking insulation).

VENTILATED ROOF

- Insulation is towards the inside of the rafters with a ventilation space of at least 50 mm between the insulation and the sarking felt.
- Ventilation from eaves to eaves over the attic room is required. For roof pitches over 35 degrees, ventilation is also needed at the ridge.
- The vapour control layer which is required behind the plasterboard lining on the sloping part of the ceiling should not be broken by making holes for services.
- Rafters are usually not very deep, so extra insulation can be provided either by battening out the rafters or by using a thermal board instead of the normal plasterboard lining.
- Insulation to the vertical part of the attic lining is normally mineral wool or rigid plastic insulating boards, friction-fitted between the timber studs.
- Thermal board is a convenient way of adding insulation to dormer sides.
- Installation can be carried out by an experienced DIYer.



Spacer battens or nails ensure an adequate ventilation gap between the insulation and the roofing felt when insulating a sloping roof

SARKING INSULATION

- Insulation is fitted towards the outside of the rafters, without the need for ventilation or a vapour control layer.
- A number of proprietary systems are available which use mineral wool and polystyrene insulation boards.
- Installation is best carried out by a specialist contractor.
- It is an option only when the roof covering is to be replaced.

Cost-effective for an extension, or if done when re-roofing

IMPORTANT NOTES

Ventilated roof

- It is essential that the ventilation path at the eaves and behind the insulation to the sloping part of the ceiling is not blocked.
- The method is not suitable if cross ventilation behind the insulation cannot be provided.

Sarking insulation

- This is useful where cross ventilation is not practical.
- The insulation must be sealed to the timber rafters and the wall plate.

D

FLAT ROOF INSULATION

Flat roof insulation is worthwhile if the roof covering needs to be replaced and the roof has not previously been insulated

INSTALLATION

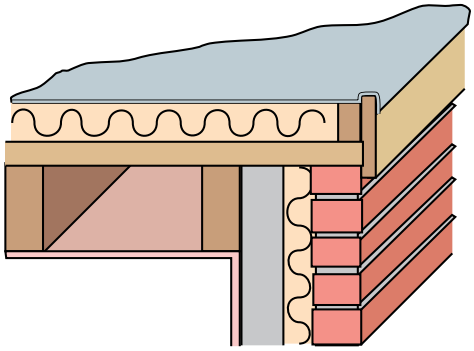
- The best way to insulate a flat roof is above the roof deck (the boarding on top of the timber joists).
- The insulation can be either between the roof deck and the weatherproof covering (sandwich method) or on top of the weatherproof covering (inverted method).

Sandwich method

- suitable when the roof covering, and possibly the roof deck, need to be replaced
- ventilation of the space between timber joists is not required
- a high-performance vapour control layer must be bonded to the deck with the joints sealed in hot bitumen
- polystyrene, urethane and high-density mineral wool are the more common insulation materials
- a job for the specialist roofing contractor.

Inverted method

- insulation needs to be weighted down with 'ballast' to stop it being lifted by the wind
- ballast is normally paving slabs, pebbles or cement topping to the insulation
- existing timber roofs are not normally strong enough to support the extra weight
- extruded polystyrene and high-density mineral wool are the more common insulation materials
- a job for the specialist roofing contractor.



If replacing the weatherproof membrane on a flat roof it may be possible to install insulation between the roof structure and the new weather-proof membrane at the same time

COMMON QUESTIONS

Would polystyrene ceiling tiles in the room below insulate just as well?
No. Polystyrene tiles are about 10 mm thick. You would need about 50 mm of polystyrene for this to be worthwhile.

What should I do if I already have some insulation in my flat roof and the roof deck does not need to be replaced?
If the insulation is mineral wool, you should add extra insulation above the deck only if the insulation value of the new insulation is at least 3 times better than your mineral wool insulation below the deck.

Sandwich roof

- The new weatherproof covering needs to be finished with white chippings or solar reflective paint to stop it overheating in the sun.

Inverted roof

- The insulation must be completely covered by the 'ballast' layer.
- Gravel ballast may be blown to expose the insulant if the roof is not designed to take account of local wind conditions – seek specialist advice.

REFERENCES

GPG 12
'Pitched roof insulation in existing housing – a practical guide for specifiers'
GPG 79
'Energy efficiency in new housing'
GPG 155
'Energy efficient refurbishment of existing housing'
see bibliography

D

Floor insulation

EFFECTIVENESS

- Ground floor insulation is most effective for small detached houses because most heat is lost near outside walls.
- For a semi-detached house with suspended timber floors, 100 mm of mineral wool insulation can reduce heat loss through the floor by up to 60%.
- Insulation *below* a concrete slab is worthwhile for extensions (including conservatories) and when the complete floor has to be replaced.
- Insulation *above* an existing concrete floor is worthwhile only if doors, stairs, kitchen fittings, sanitary fittings and skirtings are unaffected by the extra thickness of flooring.

WHEN TO DO IT

- when floorboards need to be lifted (eg to run pipes or wiring, or to deal with rot) or if there is access from below (eg from a basement).

MAIN TYPES OF FLOOR

- suspended timber
- solid concrete

Solid floors are usually at ground floor level, except for flats. Suspended floors can be ground floors or upper floors above a pedestrian walkway (outside) or an unheated space (eg a garage).

Things to bear in mind about floor insulation

HOME IMPROVEMENTS

Moving into a new home	Install insulation when carrying out major renovation
Extension	The most cost-effective time to insulate the floor
Loft conversion	
Nursery	
New kitchen	Install insulation when carrying out major renovation
New bathroom	
New heating system	Insulate to reduce the size of the heating system
Conservatory	Insulation helps retain the sun's heat to warm the room

Re-roofing	
Replacement windows	
Re-wiring	Insulate timber floors if the boarding is lifted for re-wiring
Re-flooring	The most cost-effective time to insulate the floor
Replacement boiler	
Redecorating	
Re-rendering	

BUILDING PROBLEMS

High fuel bills	Insulation can make lower fuel costs possible
Poor heating	Insulation improves heating performance
Insufficient hot water	

Cold rooms	Insulation can make rooms more comfortable
Too draughty	
Too stuffy	
Musty rooms	Insulation, in conjunction with heating and controlled ventilation, prevents condensation and mould
Condensation	

Penetrating/ rising damp	Insulate the floor if boarding is lifted or replaced
Burst pipes and leaks	
Wet or dry rot	
Rotten windows	

Noise	

★ Floor insulation increases comfort

IMPORTANT NOTES

- Floor insulation, in conjunction with wall insulation, adequate heating and controlled ventilation, is effective in preventing condensation and mould growth.
- Insulation should be carried out either before, or at the same time as, installing a new heating system, because the reduced heat loss should make it possible to have a smaller and therefore a cheaper heating system.

D

Floor insulation

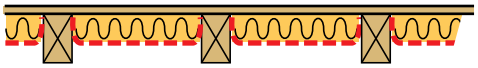
Floor insulation is especially worthwhile for accessible suspended timber floors

SUSPENDED TIMBER FLOORS

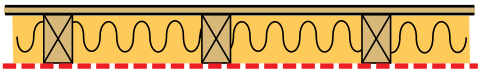
- Insulation materials can be mineral wool quilts, polystyrene boards or blown insulation.
- The mineral wool quilt is supported by plastic mesh/netting or boarding fixed to the side or the underside of the joists.
- Polystyrene boards are supported and held down against timber battens nailed to the sides of the joists.
- Blown insulation needs to be contained by mesh or boarding beneath the joists.
- All can be installed by an experienced DIYer, except for blown insulation.

SOLID CONCRETE FLOORS

- When a new concrete floor is laid, it is best insulated below the slab.
- Insulation *below* the slab is usually polystyrene, high density mineral wool or cellular (foamed) glass.
- Insulation *above* an existing concrete floor is usually mineral wool or polystyrene, in conjunction with timber-based flooring (eg chipboard).
- Normally, a job for a builder as part of major renovation.



When floor boards are lifted, support mesh or netting can be draped over and fixed to the sides of the joists



When there is access from below, the support boarding or mesh can be fixed beneath the joists

Chipboard flooring being laid over insulation

Suspended timber floors

- Insulation should be taken right up to the edge of the floor and any space close to the outside wall filled with mineral wool insulation to avoid a thermal bridge.
- The insulation should not block the air bricks in the outside wall which are there to ventilate the space under the floor and prevent rot.

Solid concrete floors

- Insulation below the slab should be strong enough to support the concrete and, if it is below the damp proof membrane (dpm), resistant to chemicals and moisture in the ground.
- Timber-based flooring used with insulation above the slab must be protected by a dpm, tongued and grooved and glued at the joints.

IMPORTANT NOTES

Suspended timber floors

- To cut out draughts and increase comfort, gaps between floor boards can be filled with a patent filler, or thin sheets of hardboard can be laid across the whole floor. The skirting should be draughtstripped to the flooring and all holes for services filled.
- A fire-resistant board should be used beneath the joists if the floor is above a garage or basement.

Solid concrete floors

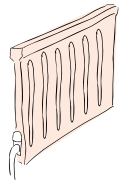
- It is not advisable to insulate above the floor in conjunction with timber-based flooring in 'wet' rooms, such as kitchens and bathrooms.
- The surface of the concrete slab must be flat and free from plaster and mortar droppings to ensure that insulation boards above the slab do not 'rock'.

REFERENCES

GPG 9
'Ground floor insulation in existing housing – a practical guide for specifiers'
GPG 155
'Energy efficient refurbishment of existing housing'
see bibliography

D

Heating system



ALL TYPES OF SYSTEM

EFFECTIVENESS

Wet central heating system

- Older boilers are less efficient.
- If the boiler is over 15 years old, and needs replacing, a modern boiler could cut heating energy bills by up to 15%.
- A replacement condensing boiler could cut heating energy bills by a further 15% (about 30% over the original boiler).
- A new boiler plus the right heating controls can cut fuel bills by 20-35%.
- If a boiler is less than 10 years old, it is probably more economical to invest in controls (see page 28).
- Householders will only get the best from their heating system if they understand the controls.

TYPES OF HEATING SYSTEM

- wet central heating systems
- other central heating systems
- individual heaters

Wet central heating systems can be fuelled by gas (natural or LPG), oil or solid fuel. Other central heating systems can be based on electric storage or warm air units (using gas or electricity).

Things to bear in mind about heating systems

HOME IMPROVEMENTS

Moving into a new home	Upgrade as part of major renovation or decoration
Extension	Upgrade the boiler if the system is being extended
Loft conversion	
Nursery	
New kitchen	Upgrade the boiler if it is over 10 years old
New bathroom	Upgrade the boiler if the system is being extended
New heating system	Consider a condensing boiler
Conservatory	

Re-roofing	
Replacement windows	
Re-wiring	Upgrade electric central heating, if electricity preferred
Re-flooring	A good time to insulate heating pipes beneath the floor
Replacement boiler	Consider a condensing boiler
Redecorating	
Re-rendering	

BUILDING PROBLEMS

High fuel bills	Consider upgrading to a more efficient type, any heating and hot water system that is over 10 years old
Poor heating	
Insufficient hot water	

Cold rooms	Opportunity to upgrade the heating system
Too draughty	
Too stuffy	
Musty rooms	Heating, in conjunction with insulation and controlled ventilation, prevents condensation and mould
Condensation	

Penetrating/ rising damp	
Burst pipes and leaks	Survey by professional installer and upgrade
Wet or dry rot	
Rotten windows	

Noise	

New heating systems are much more efficient than old ones

IMPORTANT NOTES

- Heating, in conjunction with insulation and controlled ventilation, is effective in preventing condensation and mould growth.
- The type of system needed depends on how many rooms need to be heated, for how much of the day and whether water needs to be heated as well.
- Insulation should be carried out either before or at the same time as installing a new heating system, because the reduced heat loss should make it possible to have a smaller and therefore a cheaper heating system.

D

WET CENTRAL HEATING SYSTEM

A wet central heating system is usually the best option for two-bedroom or larger homes if you want to be able to heat every room

MAIN TYPES OF BOILER

- condensing boiler
- modern non-condensing boilers
- combination boiler (including condensing combi)
- thermal store.

The boiler heats water for space heating and hot water. Boilers usually last for 10-15 years, but may last longer if properly and regularly serviced.

Newer boilers can have a balanced flue which allows fresh air to enter the boiler and gases to escape directly through the external wall.

The efficiency of the boiler is expressed as a percentage figure – the higher the figure the more efficient the boiler and the less it costs to run. The efficiencies given here are annual.

Condensing boilers

- suitable for all types of home or flat
- most efficient type of boiler, with a typical seasonal efficiency of 85%
- efficiency remains high even when working at a low level of output, eg only for hot water in summer
- cost more to buy than other boilers but pays back quite quickly, especially in larger homes which use more fuel
- needs a drainage connection
- often has a characteristic 'plume' of water vapour coming from the flue – indicating that the boiler is functioning efficiently.

Modern non-condensing boilers

- mostly fan-assisted
- the next most efficient after a condensing boiler, with a typical seasonal efficiency of 72%.

Combination boilers

- sometimes a good option for small properties as no hot water cylinder is required
- hot water is provided on demand at mains pressure, so no cold water tank or pipes are needed in the loft space
- typical seasonal efficiency is 71% for fan-assisted non-condensing types
- condensing types are available, with a seasonal efficiency of 85%
- the range of gas combis and outputs now available is sufficient to meet the heating and hot water requirements in both larger properties and smaller homes.

Thermal stores

- stores water either within the boiler or apart from it
- sometimes a good option for small flats as less space is required
- most models take water direct from the mains so a cold water tank may not be required
- avoids boiler short cycling so has a good system efficiency.

IMPORTANT NOTES

- For maximum energy efficiency, the boiler size should not be larger than is necessary to provide comfortable temperatures.
- Insulation should be upgraded before the heating system so that the boiler can be smaller.
- Radiators are usually located below windows to prevent down-draughts; curtains should not be allowed to drape over them.
- Do not position furniture immediately in front of a radiator.
- A new central heating boiler is best installed in summer.

- Upgrade the heating and hot water controls so the boiler heats only water that is really needed.
- Use the boiler to heat the water if it does not already do so.
- Boilers without a balanced flue draw fresh air from the room and therefore need a permanent fresh air intake, usually an air brick or ventilator. THIS MUST NOT BE SEALED UP.
- Oil storage tanks – a remote acting valve MUST be fitted where the oil line enters the building to cut off the oil supply if there is a fire.

REFERENCE

GPG 155
'Energy efficient refurbishment of existing housing'
GPG 143
'Upgrading controls in domestic wet central heating systems'
see bibliography

OTHER CENTRAL HEATING SYSTEMS

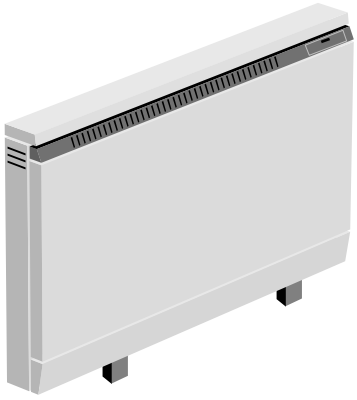
ELECTRIC CENTRAL HEATING

- The cheapest electric heating is by storage heaters using off peak tariffs.
- Modern storage heaters are much more efficient than older ones (they use about 15% less energy).
- Electric central heating is comparable in cost over the life of the system to gas for small, well insulated flats and bedsits.

Other forms of central heating are available using gas (natural or LPG) or electricity

AUTOMATIC FAN STORAGE HEATERS

- Some types include a convector to provide top-up heating, if required in winter and occasionally in summer.
- Insulation is three times better than in conventional storage heaters, so heat is given out much more slowly, leaving more to be controlled by the thermostat.
- A fan extracts heat from the storage core when more heat is needed than is given out through the casing.



Modern slimline storage heaters are more efficient and less obtrusive than traditional ones

WARM AIR UNITS

- Run on gas (natural or LPG), oil or electricity.

Replacement units

- consider replacing heat exchangers older than 10-15 years with newer, energy efficient types (7-8% more efficient, depending on use)
- whole house replacement cost: £1300-£1500
- new units are able to heat water and run radiators in rooms without using ducts.

Controls

- time and temperature controls should be fitted
- individual grilles usually have sliding 'dampers' which open and close.

Ducts

- short ducts: a fan drives the warm air through the grilles close to the central unit – popular in well-insulated small homes
- perimeter ducts: a fan drives the warm air through ducts to outlets at the perimeter of the building
- ducts should be positioned to minimise transmission of noise from room to room.

D

New automatic fan-assisted storage heaters are more efficient than older ones

IMPORTANT NOTES

Electric central heating system

- system combines cheap rate storage heaters with full price supplementary heaters (see page 25).

Warm air units

- for efficient running, grilles and filters should be kept clean
- there should be no possibility of air from the kitchen or bathroom being recirculated to the rest of the home.

INDIVIDUAL HEATERS

Individual heaters may be enough to heat a small well-insulated home

TYPES OF INDIVIDUAL HEATER

Individual heaters may be run on:

- natural gas
- bottled gas
- electricity
- solid fuel
- paraffin.

NATURAL GAS HEATERS

Wall convector heaters

- usually require a balanced flue, so are fitted to an outside wall (70% efficient); a full system can be built up room by room; very efficient.

RADIANT CONVECTORS

- provide radiant and convective heat
- living flame effect; convective heat
- inset live fuel effect; fire is partially inset within fireplace opening and flames are usually open
- decorative fuel effect fire (0-25% efficient); totally inset within the fireplace opening; very little heat produced; use is mainly decorative; least efficient.

BOTTLED GAS PORTABLE HEATERS

- high running costs; slightly cheaper than an electric fan heater
- high risk of condensation through the production of water vapour (about 1 kg of water per kg of liquid gas).

ELECTRIC HEATERS

- are 100% efficient but the most expensive when run on full price tariff
- **fan heaters** and **bar fires** should be used for supplementary heating only
- **oil-filled radiators** should be run on cheap rate electricity tariffs where possible
- **panel heaters** are often used to supplement storage heaters as part of an electric central heating system; should have time and thermostatic controls.

SOLID FUEL HEATERS

- room heater with back boiler or independent boiler burning approved smokeless fuels, both natural and manufactured (most efficient)
- open fire with high output back boiler (around 70% efficient)
- room heater without back boiler
- open fire with back boiler
- open fire without back boiler; installing a throat restrictor will control the amount of over-fire air being withdrawn from the room and therefore will improve efficiency (least efficient).

PARAFFIN HEATERS

- cheaper than those using bottled gas or full price electricity
- same risk of condensation as bottled gas portable heaters
- fire risk if heater knocked over.

- All individual heaters without balanced flues (gas, oil, LPG and solid fuel) must have enough fresh air brought into the room from outside for their safe operation.
- Portable heaters using paraffin or bottled gas (LPG) need plenty of ventilation to prevent condensation.

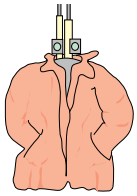
IMPORTANT NOTES

- In a very well-insulated small home, two or three natural gas wall convectors may be enough.
- The most efficient individual heaters have time and temperature controls.
- Individual heaters in the living room can supplement central heating in winter and provide occasional heating in summer.
- Manufactured and naturally occurring solid smokeless fuels are usually more efficient (> 10%) than household coal.

REFERENCE

GPG 155
'Energy efficient refurbishment of existing housing'
see bibliography

Hot water system



EFFECTIVENESS

- Insulating the hot water cylinder is cheap to do, with a fast payback of under a year for DIY jobs.
- A hot water cylinder jacket can give savings of up to £20 annually.
- Worth doing even if the tank already has insulation less than 80 mm thick – just put another one on top. A new jacket should conform to BS 5615: 1985.
- Use pre-formed foam tubes or 75 mm wide insulation roll to insulate pipework.

WHEN TO DO IT

- Insulating the cylinder can be done at any time, as can any pipework which is easy to get at.

TYPES OF HOT WATER SYSTEM

- hot water cylinder linked to a boiler
- combination boiler
- electric immersion heater
- instantaneous gas water heaters
- hot water cylinder linked to back circulator
- direct-fired hot water storage heaters

Things to bear in mind about hot water systems

HOME IMPROVEMENTS

Moving into a new home	A good time to insulate primary pipework and cylinder
Extension	
Loft conversion	A good time to insulate any pipework in the roof space
Nursery	
New kitchen	A good time to insulate primary pipework and cylinder
New bathroom	
New heating system	Choose a high recovery cylinder and insulate pipework
Conservatory	

Re-roofing	
Replacement windows	
Re-wiring	For electric HW consider a large cylinder with dual immersion
Re-flooring	
Replacement boiler	Install a high recovery cylinder and insulate pipework
Redecorating	
Re-rendering	

BUILDING PROBLEMS

High fuel bills	Insulate primary pipework and hot water cylinder – check thermostat setting on cylinder
Poor heating	
Insufficient hot water	Install a high-recovery, well-insulated cylinder

Cold rooms	
Too draughty	
Too stuffy	
Musty rooms	
Condensation	

Penetrating/ rising damp	
Burst pipes and leaks	Insulate pipework that runs through cold spaces
Wet or dry rot	
Rotten windows	

Noise	

Remember to insulate pipes and cylinders and fit thermostats to cylinders

IMPORTANT NOTES

- Cylinder thermostat – all hot water cylinders should be fitted with a cylinder thermostat to regulate the water temperature in the cylinder.
- Electric heating – if hot water is heated by electricity consider switching to off-peak rate to save money.

Hot water system

The primary pipework (between boiler and cylinder) and hot water cylinder (if there is one) should always be insulated

High recovery

- suitable for any wet centrally heated system
- a high recovery coil (multi-coil) enables a smaller capacity cylinder to be used
- makes better use of the boiler's capacity when heating the hot water, and so improves seasonal efficiency
- should have a minimum of 50 mm insulation.

Dual immersion heater

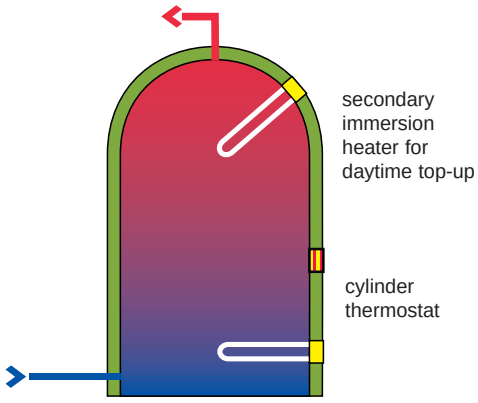
- uses off-peak electricity to heat the whole tank and tops up at peak rate.

Unvented systems

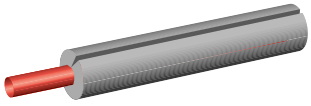
- take water directly from the mains
- save on pipework and no tank in loft
- do NOT save energy, because hot water cylinder still required to store hot water.

Pipework insulation

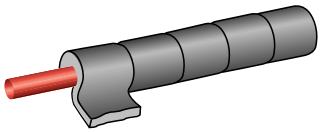
- most important is primary pipework between boiler and cylinder
- also worth doing – at least the first metre of pipes between cylinder and hot water taps, and pipes in loft, including overflow.



If water is being heated only by electricity, use a larger cylinder with dual immersion heaters and extra insulation



preformed insulation



wrap round insulation

Insulating the pipes between the boiler and the hot water cylinder prevents unnecessary heat loss

- Don't forget to insulate pipes in loft – including overflow pipes, to stop them bursting, especially if loft itself is insulated.

REFERENCE

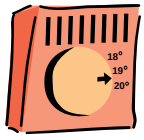
GPG 143
'Upgrading controls in domestic wet central heating systems – a guide for installers'
GPG 155
'Energy efficient refurbishment of existing housing'
see bibliography

IMPORTANT NOTES

- Wet systems with a hot water cylinder should be fully pumped for optimum efficiency, and should be fitted with a suitable control of hot water temperatures.
- Short dry cycling (boiler goes on firing even when heat no longer required) wastes energy – it is caused by:
  - no room/cylinder thermostat
  - room/cylinder thermostat not interlocked
  - TRVs fitted without boiler interlock.

D

Controls for heating and hot water



EFFECTIVENESS

- As much as £80 per year can be saved by a typical semi-detached house with a full controls upgrade package.
- TRVs can save £20-£35. Installation costs are from £150 (for six TRVs) and much less when fitted at the same time as carrying out other work on the heating system.

TYPES OF CONTROL

- programmer and timer
- room and cylinder thermostats
- zone controls
- thermostatic radiator valves

Things to bear in mind about controls

HOME IMPROVEMENTS

Moving into a new home	A good time to upgrade heating and hot water controls
Extension	If the heating system is being drained down, upgrade heating and hot water controls and install thermostatic radiator valves (TRVs)
Loft conversion	
Nursery	
New kitchen	
New bathroom	
New heating system	Insist on efficient time and temperature controls
Conservatory	

Re-roofing	
Replacement windows	
Re-wiring	A good time to upgrade heating and hot water controls
Re-flooring	
Replacement boiler	A good time to upgrade heating and hot water controls
Redecorating	
Re-rendering	

BUILDING PROBLEMS

High fuel bills	Install efficient time and temperature controls
Poor heating	Check thermostat settings and air locks in radiators
Insufficient hot water	Check thermostat settings on boiler and cylinder

Cold rooms	Check thermostat settings and air locks in radiators
Too draughty	
Too stuffy	Install efficient heating controls or turn them down
Musty rooms	Make sure that the heating is adequate to avoid condensation and mould growth
Condensation	

Penetrating/ rising damp	
Burst pipes and leaks	Upgrade controls if the system is drained down
Wet or dry rot	
Rotten windows	

Noise	

The proper use of controls ensures that energy is not wasted

IMPORTANT NOTES

- Upgrading controls can be done at any time but a good time would be when changing your boiler, or when other work is being done on the heating system.

D

Controls for heating and hot water

The right controls are crucial to the efficient running of heating and hot water systems

Programmer and time switch

- turns the heating and hot water on and off at required times, either separately or together.

Room thermostat

- turns boiler off when room temperature has reached required level
- fit about 1.5 m up from floor level.

Hot water cylinder thermostat

- fits on to the cylinder to avoid water overheating by switching off boiler when required temperature is reached
- recommended temperature is 60-65°C.

Zone controls

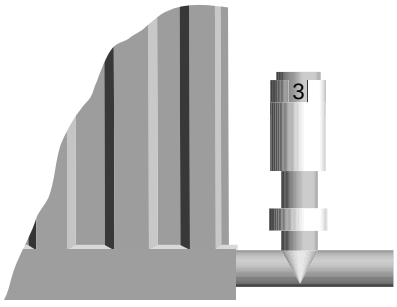
- allow two or more zones within the house to be controlled separately
- particularly cost-effective for larger properties.

Thermostatic radiator valves (TRVs)

- are fitted on to individual radiators and have a range of temperature settings
- reduce flow of water to radiator as thermostat reaches its set temperature
- turn down radiators to take advantage of sunshine or other heat sources
- provide lower temperatures for background heating, eg in unused rooms
- normally used in conjunction with a room thermostat control system or a boiler energy control system.

Storage heater controls

- automatic storage heaters have a thermostat to govern heat output/storage during off-peak and on-peak times
- the following controls are available for fan storage heaters/combination heaters:
  - *room temperature thermostat*; an external sensor automatically switches the core extract fan (and convector if in use) off when room temperature reaches the required level
  - *convector control;* wired to the thermostat so that it will come on only when the stored heat has been largely used up
  - *external timer;* controls both the core extract fan and convector.



TRVs allow individual rooms to be heated differently, eg bedrooms might be heated to a lower temperature than living rooms

- TRVs should not be fitted in the room that has the room thermostat – the room thermostat will not turn the heating off when it should.
- The room thermostat should not be fitted near radiators, in a draughty or sunny location, or in rooms with TRVs or supplementary heating (eg room heaters).

REFERENCE

GPG 143
'Upgrading controls in domestic wet central heating systems – a guide for installers'
GPG 155
'Energy efficient refurbishment of existing housing'

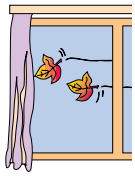
see bibliography

COMMON QUESTIONS

What is the best control system for a wet central heating system?
*A **full controls package** (see section C) will typically consist of:*

- *programmer*
- *room and hot water cylinder thermostat*
- *motorised valves to provide independent control of heating and hot water*
- *controls wired so that boiler operates only when required*
- *conversion to fully pumped system where necessary.*

Draughtstripping



EFFECTIVENESS

- Badly fitting doors and windows are a major source of heat loss.
- Gaps under skirtings and around the loft hatch are also major sources of heat loss.
- Savings vary widely but can be as much as £30 per year for a 3 bedroomed house.

Draughtstripping is quite cheap, easy to do and can greatly increase comfort as well as saving on fuel bills

Things to bear in mind about draughtstripping

HOME IMPROVEMENTS

Moving into a new home	Draughtstrip and seal gaps before decorating/furnishing
Extension	A good time to seal floors, external doors and windows
Loft conversion	A good time to seal gaps and draughtstrip windows to avoid heat loss and improve comfort
Nursery	
New kitchen	Draughtstrip windows and external door if ventilation is adequate
New bathroom	Draughtstrip windows if ventilation is adequate
New heating system	Seal gaps where pipes pass into a cold region
Conservatory	Draughtstrip windows and doors to the house and to the outside

Re-roofing	
Replacement windows	Make sure the new windows are properly draughtstripped
Re-wiring	Seal gaps where wires and cables pass into cold regions
Re-flooring	Seal gaps in timber floors but ensure sub-floor ventilation
Replacement boiler	Ensure an air supply for the safe operation of the boiler
Redecorating	A good time to seal floors, external doors and windows
Re-rendering	

BUILDING PROBLEMS

High fuel bills	Draughtstripping helps to reduce fuel costs
Poor heating	Draughtstripping improves heating performance
Insufficient hot water	

Cold rooms	Draughtstripping reduces heat loss and improves comfort
Too draughty	Draughtstripping cuts draughts and improves comfort
Too stuffy	
Musty rooms	Draughtstrip, but make sure there is enough heating and controlled ventilation to prevent condensation and mould growth
Condensation	

Penetrating/ rising damp	Seal timber floors when boarding is replaced
Burst pipes and leaks	
Wet or dry rot	
Rotten windows	Make sure new windows are properly draughtstripped

Noise	Draughtstripping can greatly reduce annoying external noise

★ Comfort is greatly increased

Important notes

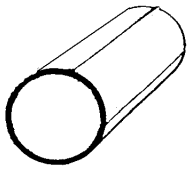
- Draughtstripping materials complying with BS 7386 should last for many years and recover their initial cost in fuel savings.
- Advice on the choice of draughtstripping and a list of approved installers is available from the Draught Proofing Advisory Association (see Contacts, page 43).
- Grants may be available (see page 42).

D

Draughtstripping

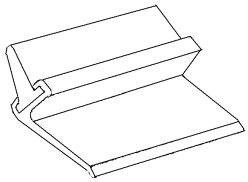
DRAUGHTSTRIPS FOR WINDOWS

Silicone 'O' strip



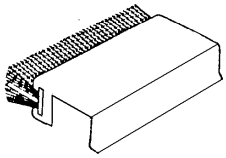
- silicone 'O' tube (variety of sizes) glued with silicone adhesive
- several sizes available to cover gaps up to 10 mm.

Fin or blade seal

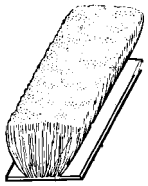


- good for wooden doors and casement windows
- some types suitable for sliding applications.

Brush pile



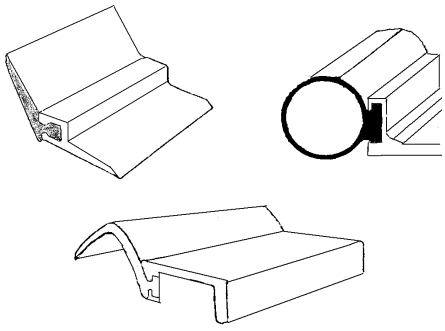
Brush pile (various heights) bonded to carrier



Brush pile, self-adhesive; available in several pile heights for different gaps

- suitable for most doors and window types
- especially good on sliding windows and doors but care needed when repainting to avoid damaging the pile.

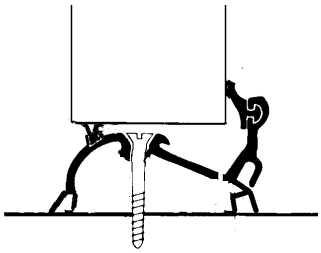
DRAUGHTSTRIPS FOR EXTERNAL DOOR SIDES AND TOPS



- seals in good quality rubber (EPDM, silicone), sheathed foam or nylon brush, with rigid PVC-U or aluminium carriers nailed or screwed to frame of door
- fitting with initial 3 mm compression allows for seasonal movement of door
- care may be needed when painting to avoid damage to brush and some types of rubber.

THRESHOLD SEALS

- normally made from aluminium and incorporate flexible draught- and weather-strips
- low profile sections are available for wheeled traffic and ease of access.



- Adequate ventilation must be ensured for combustion air to ALL OPEN FLUED APPLIANCES – draughtstripping must allow enough fresh air to enter the room to burn fires safely.
- The top edges of existing windows should not be draughtstripped if trickle vents are not fitted (see controlled ventilation, page 33).
- The loft hatch should be draughtstripped to prevent moisture from the house condensing in the roof space.
- When ground floor skirtings are being replaced or re-fitted they should be seated on a draughtstrip to reduce heat loss and prevent draughts.

REFERENCE

GPG 139 'Draughtstripping of existing doors and windows'

see bibliography

Controlled ventilation

ALL TYPES OF VENTILATION CONTROL

EFFECTIVENESS

- Approximately 17% of heat is lost through uncontrolled ventilation in a typical two-storey semi-detached house.
- Controlled ventilation minimises heat loss by providing only the right amount of ventilation.

MAIN TYPES OF VENTILATION CONTROL

- background ventilation (trickle vents)
- rapid ventilation (eg extract fans)
- ducted systems, including heat recovery.

PURPOSE OF CONTROLLED VENTILATION

- supplies fresh air for fires and appliances (gas and solid fuel)
- maintains good air quality for healthy living conditions
- reduces condensation.

Things to bear in mind about controlled ventilation

HOME IMPROVEMENTS

Moving into a new home	A good time to draughtstrip and seal floors
Extension	Upgrade ventilation control in the main part of the home
Loft conversion	Make sure that ventilation is adequate and controllable
Nursery	
New kitchen	
New bathroom	
New heating system	
Conservatory	

Re-roofing	Ensure there is enough cross ventilation to the loft space
Replacement windows	Make sure new windows are fitted with trickle ventilators
Re-wiring	
Re-flooring	Ensure that sub-floor ventilation is not blocked
Replacement boiler	Ensure ventilation is provided for safe operation of the boiler
Redecorating	A good time to seal gaps to stop uncontrolled ventilation
Re-rendering	

BUILDING PROBLEMS

High fuel bills	Controlled ventilation helps to reduce fuel costs
Poor heating	Controlled ventilation helps to improve comfort
Insufficient hot water	

Cold rooms	Controlled ventilation helps to improve comfort
Too draughty	
Too stuffy	
Musty rooms	Controlled ventilation, in conjunction with heating and insulation, prevents condensation and mould
Condensation	

Penetrating/ rising damp	Ensure that sub-floor ventilation is not blocked
Burst pipes and leaks	
Wet or dry rot	Ensure that floor and roof ventilation is not blocked
Rotten windows	Make sure new windows are fitted with trickle ventilators

Noise	Controlled ventilation can cut out annoying external noise

★ Controlled ventilation reduces waste heat

IMPORTANT NOTES

Whichever ventilation system is used it is essential to make sure that the householder knows how to use it and understands the importance of not blocking fresh air vents such as trickle vents and air bricks, or disabling extract fans or other mechanical systems.

D

Controlled ventilation

TRICKLE VENTS AND EXTRACT FANS

The aim is to create adequate controllable ventilation while minimising uncomfortable draughts and heat loss

Trickle vents

- simplest method of providing background ventilation
- cheap to install, no maintenance required
- not usually enough on their own but reduce need to open windows
- NOT SUITABLE for high rise flats due to wind.

Trickle vents allow background ventilation without having the windows open

Extract fans

- fitted in kitchen and bathroom on wall, ceiling or through window
- optional controls include humidistats (switches fan on automatically when air reaches set humidity) and timer (fan runs on for a time after being switched off)
- relatively cheap and easy to maintain
- most effective when installed at high level away from the source of fresh air (internal doors and trickle vents)
- in the kitchen, ideally combined with a cooker hood.

Passive vents

- an alternative to extract fans which use no electricity
- fitted through external wall (looks like an extract fan)
- open automatically when humidity reaches a certain level.

REDUCING CONDENSATION

- Open-flued appliances (those drawing air from the room, rather than outside) need permanently open ventilators as close as possible to them.
- Extract fans are cheap to run and should not be disabled in an attempt to cut costs.

IMPORTANT NOTES

- New windows should include trickle vents and be fully draughtstripped.
- Trickle vents improve security because they avoid the need to leave windows open for ventilation when the home is unoccupied.

REFERENCE

GIL 9
'Domestic ventilation'

see bibliography

DUCTED SYSTEMS

EFFECTIVENESS

- Mechanical ventilation with heat recovery (MVHR) is not cost-effective on energy saving grounds alone – it is usually installed to solve condensation and air quality problems.
- Passive stack ventilation (PSV) and mechanical ventilation with heat recovery (MVHR) are only worth while as part of full refurbishment.

Ducted systems are either passive stack or based on mechanical extract

PASSIVE STACK VENTILATION (PSV)

- Extract ducts run upwards from ceiling grilles in kitchen or bathroom to the outside through the roof, with fresh air coming in through trickle vents.
- PSV removes moist air continuously without mechanical action.
- It works because of a pressure difference between outside and inside the house.
- Grilles and ductwork need regular cleaning to remove dust.
- Installation is fairly simple.
- It is much quieter than extract fans but boxing for ductwork may be considered unsightly and take up too much space (ducts are usually 80-125 mm in diameter).

MECHANICAL VENTILATION WITH HEAT RECOVERY (MVHR)

- Whole house systems extract warm air from kitchen, bathroom and WC via ducts, passing it through a heat exchanger to recover heat and warm the incoming air, which is ducted into living rooms and bedrooms.
- It provides controlled and pre-warmed fresh air throughout the house and reduces moisture at source.
- It is unlikely to be worth doing to save energy due to high capital and maintenance costs and complexity of installation.
- It is only effective if house is well sealed.
- Cost around £750-£2000.

INDIVIDUAL HEAT RECOVERY UNITS

- Individual heat recovery room units can be installed in an external wall.
- Cost around £150-£200 to buy.

MVHR systems improve air quality

IMPORTANT NOTES

- PSV may not be suitable for all houses – it depends on the layout of the rooms.
- MVHR is usually installed for health reasons (to avoid condensation and provide clean air for those suffering from asthma and particular allergies).

Controlled ventilation

CONDENSATION, MOULD AND DAMP

Damp can cause mould on walls and furniture and make timber window frames rot. Some damp is caused by condensation

WHAT CAUSES CONDENSATION?

- When warm moist air hits a cold surface some water is deposited on it as condensation.
- Condensation occurs mainly during cold weather, whether it is raining or dry.
- The colder the surface the air hits, and the more moisture the air contains, the more condensation will be formed.
- Lack of insulation, adequate heat and ventilation can cause condensation.

Condensation on windows and walls

- occurs first on single glazing, then on parts of rooms where there is no insulation between inside and outside (thermal bridges)
- double glazing reduces condensation on glazing – insulation reduces the risk at thermal bridges.

HOW TO REDUCE CONDENSATION

The following steps should be taken together:

1 Produce less moisture

- Paraffin and portable flueless bottle gas heaters produce a lot of moisture – if condensation is a problem alternative forms of heating (ideally with a balanced flue) should be sought.
- Vent a tumble drier to the outside (unless it is the self-condensing type).

2 Ventilate

- Extract air as close as possible to the source of moisture.
- Install an extract fan in kitchen and bathroom and keep doors closed when in use to stop moisture reaching other rooms.
- Where possible install trickle vents in other rooms, eg bedrooms.

3 Insulate and draughtstrip

- Insulate external walls and loft (see pages 12 and 17).
- Draughtstrip around doors and windows, but only fully if there are trickle vents (see pages 30 and 31).
- Condensation is less likely when the whole home is warmer.

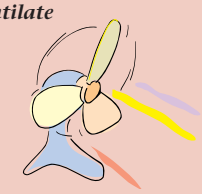
4 Heat the home adequately

- If necessary, install a small heater in bedrooms and other little-used rooms to run at a low heat all day.
- If the house is centrally heated, install TRVs to make it possible to have background heating in little-used rooms (see page 29).

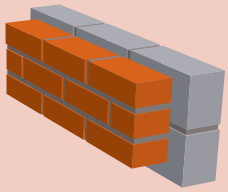
REDUCING CONDENSATION

1 Produce less moisture

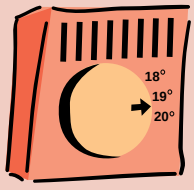
2 Ventilate



3 Insulate and draughtstrip



4 Heat adequately



POSSIBLE QUESTIONS

Won't ventilation make my house colder?

Fresh air in winter is cold, but controlled ventilation allows you to have just the right amount for a healthy, odour-free home. You must not ventilate on its own, but in conjunction with heating and better insulation.

REFERENCE

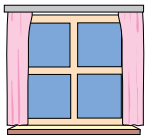
GIL 9

'Domestic ventilation'

see bibliography

D

Double glazing



EFFECTIVENESS

- For new housing, double glazing has become standard practice.
- On the basis of energy savings alone, the payback period of the on-cost for replacement windows with double glazing is 4-7 years.
- Good quality DIY secondary glazing is cheaper (overall) and as cost-effective.

WHEN TO DO IT

- The most cost-effective time to double glaze is if windows have to be replaced.

TYPES OF DOUBLE GLAZING

Double glazing can be added:

- with replacement windows
- as secondary glazing within existing windows
- with a low-emissivity coating.

Things to bear in mind about double glazing

HOME IMPROVEMENTS

Moving into a new home	Upgrade glazing with major redecoration or renovation
Extension	A good time to upgrade to double or secondary glazing
Loft conversion	
Nursery	Add secondary glazing along with major redecoration
New kitchen	
New bathroom	
New heating system	Double glazing can reduce the size of the system needed
Conservatory	Double glazing provides comfort for more of the year

Re-roofing	
Replacement windows	Make sure new windows have sealed double glazing units
Re-wiring	
Re-flooring	
Replacement boiler	
Redecorating	Add secondary glazing along with major redecoration
Re-rendering	Consider replacing windows with external renovation

BUILDING PROBLEMS

High fuel bills	Double or secondary glazing reduces heat loss and improves comfort
Poor heating	
Insufficient hot water	

Cold rooms	Double or secondary glazing reduces heat loss and improves comfort
Too draughty	
Too stuffy	
Musty rooms	
Condensation	Double or secondary glazing has less risk of condensation

Penetrating/ rising damp	
Burst pipes and leaks	
Wet or dry rot	
Rotten windows	Replace with windows having sealed double glazing units

Noise	Secondary glazing can help cut external noise

Double glazing increases comfort and reduces condensation. Low-emissivity glass further enhances these benefits.

IMPORTANT NOTES

- There may be planning restrictions on the house due to age or location – check before installing windows of a different design to the originals.

D

Double glazing

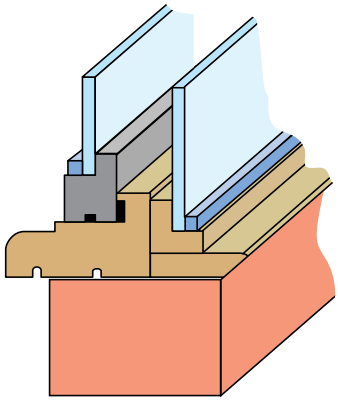
Double glazing can be added with replacement windows or as secondary glazing

Replacement windows

- most use sealed double glazing units
- wood and PVC-U frames are better insulators than aluminium (unless this has a thermal break)
- for thermal insulation purposes the optimum gap between the panes of glass is 20 mm
- low-emissivity glass has a coating inside the double glazed unit which reduces the amount of heat loss from inside the room through the window
- double glazed low-emissivity glass has the same effect as triple glazing and is cheaper.

Secondary glazing

- usually made of glass in aluminium or plastic frames: flexible plastic glazing can also be used
- can be bought in kit form and installed by a competent DIYer
- fairly economical and permanent
- professional systems are also available and can be installed by a builder
- should be draughtstripped
- can provide effective sound insulation if the panes are 150 mm or more apart.



Secondary glazing helps reduce draughts and condensation

REPLACEMENT WINDOWS

- Replacement windows should incorporate trickle vents in the top of the frame.

SECONDARY GLAZING

- Allowance should be made for escaping through the window in case of fire.
- To avoid condensation on the outer pane, its frame should NOT be draughtstripped (only the secondary glazing).

IMPORTANT NOTES

- The crucial factor in reducing heat loss is the width of the air space between the layers of glass, NOT the thickness of the glass.
- Over 20 mm gap there is little additional energy saving (12 mm air space is normal).
- Curtains that fit closely around the window opening can have an insulating effect in reducing heat loss, but they are not as effective as double glazing.

REFERENCE

GPG 155 'Energy efficient refurbishment of existing housing'

see bibliography

Low energy lighting

EFFECTIVENESS

- In most homes, lighting accounts for 10-15% of the electricity bill.
- CFLs give lifetime savings of approximately £54 per lamp over comparable tungsten filament lamps.

WHEN TO DO IT

- CFLs can be fitted at any time, but install them first where they are on for a long time, such as in the hall or kitchen.

TYPES OF LOW ENERGY LIGHTING

Low energy lamps include:

- compact fluorescent (CFLs)
- fluorescent tubes
- tungsten halogen

Things to bear in mind about efficient lighting

HOME IMPROVEMENTS

Moving into a new home	Choose low-energy lamps where lights will be on continuously for at least 4 hours
Extension	
Loft conversion	
Nursery	
New kitchen	Use fluorescents, low energy lamps or halogen spot lights
New bathroom	
New heating system	
Conservatory	

Re-roofing	
Replacement windows	
Re-flooring	
Replacement boiler	
Re-wiring	Choose low-energy lamps where lights will be on continuously for at least 4 hours
Redecorating	
Re-rendering	

BUILDING PROBLEMS

High fuel bills	Low energy lamps are cost-effective and reduce bills
Poor heating	
Insufficient hot water	

Cold rooms	
Too draughty	
Too stuffy	
Musty rooms	
Condensation	

Penetrating/ rising damp	
Burst pipes and leaks	
Wet or dry rot	
Rotten windows	

Noise	

CFLs are most cost-effective when used in fittings that are switched on for more than 4 hours

IMPORTANT NOTES

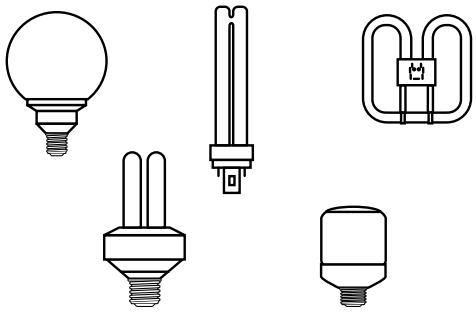
- When buying a new light fitting it is better to choose one that is designed for a 2- or 4-pin CFL so that you don't need to buy the more expensive 'plug-in' lamp.
- For outside lighting, automatic daylight sensors should be used in conjunction with time-switches in order to maximise energy savings.

Low energy lighting

Efficient lamps are available for a range of uses and circumstances

CFLs

- Compact fluorescent lamps (CFLs) last about eight times as long as tungsten bulbs and use as little as 25% of the energy used by tungsten bulbs for an equivalent light output.
- There are different fittings to suit a variety of lamp types.
- 'Plug-in' CFLs fit tungsten lampholders.
- 2- or 4-pin CFLs have light fittings designed specially for them. They are also cheaper to buy.

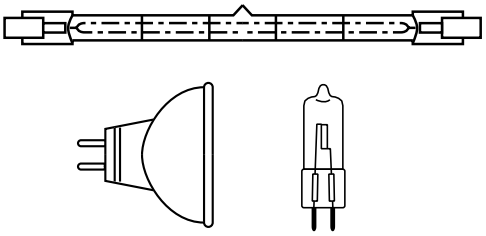


FLUORESCENT TUBES

- High frequency ballasts for fluorescent tubes, although more expensive, avoid flicker and provide an additional energy saving of 15-20%.
- Dimmable high frequency ballasts are available.
- Slimline 26 mm diameter fluorescent tubes give energy savings of around 8-10% compared with the older 38 mm fluorescent tube for the same colour rendering and are cheaper to buy.
- They are suitable for kitchens, workshops and garages.

TUNGSTEN HALOGEN

- They are very good for spotlighting/tasklighting.
- They are 50-100% more efficient than standard type bulbs and last about twice as long.
- Many tungsten halogen lights operate at 12 volts and require a small transformer.



POSSIBLE QUESTIONS

Is it true that low energy bulbs take ages to light up?

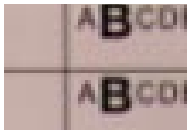
They do take a few seconds longer to light up, especially in cold conditions. Those with multiple loops have high frequency ballasts, light up instantly and quickly become bright. Globe types take longer to start and reach full brightness.

- CFLs provide a different type of light to normal lamps. CFLs also lose brightness over their life, so it may be better to buy a CFL equivalent to a slightly higher wattage than the one you are replacing, eg replace a 60 watt bulb with a 75 watt equivalent CFL.
- Special dimmer switches are required for use with CFLs.

REFERENCE

GPG 155
'Energy efficient refurbishment of existing housing'
GPG 199
'Energy efficient lighting – a guide for installers'
see bibliography

Appliance labelling



Why the labels matter

Energy efficient appliances use less electricity and therefore cost less to run

This mark shows that an appliance meets the Ecolabel criteria

Further information

- For further details contact your retailer or AMDEA (see p43)
- The UK Ecolabelling Board
  7th Floor, Eastbury House
  30-34 Albert Embankment
  London SE1 7TL
  Tel 0171 820 1199
  Fax 0171 820 1104

When buying an appliance look for the energy label

THINGS to bear in mind when buying appliances

HOME IMPROVEMENTS

Moving into a new home	When replacing appliances or buying new, look at the energy label to help choose energy efficient models
Extension	
New kitchen	

BUILDING PROBLEMS

High fuel bills	Energy efficient appliances cost less to run than others

ENERGY LABELS

The European Union introduced a COMPULSORY energy labelling scheme for household appliances in 1995 covering mains electric fridges, freezers and fridge-freezers. In April 1996 the scheme was extended to washing machines. Energy labels:

- apply to cold appliances (fridges and freezers), washing machines, tumble dryers
- rate the product on its energy efficiency.

Energy efficiency labels

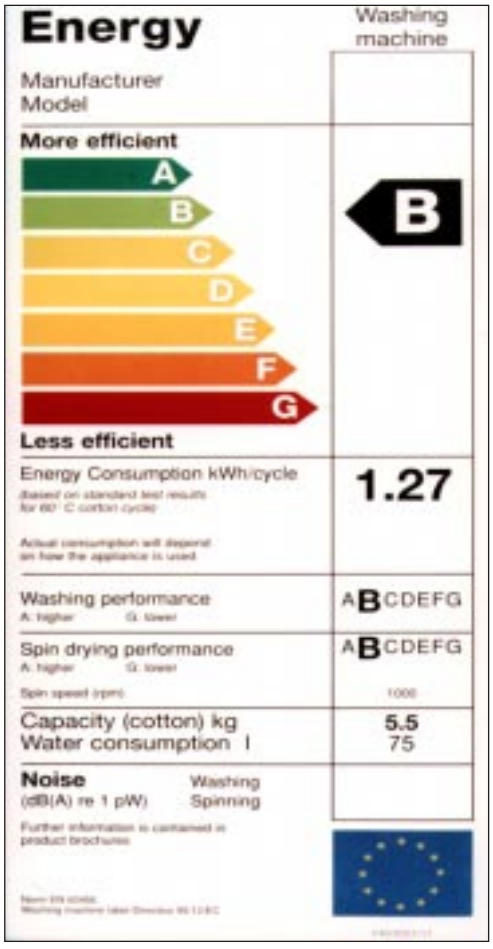
- show at a glance the energy efficiency of each model compared with other appliances in the same category
- 'A' is the most energy efficient. An 'A' rated appliance would use up to half the electricity of a similar 'G' rated model.

Energy consumption

- shows the estimated energy use of the appliance in kilowatt hours per year, or per cycle, for washing machines and tumble dryers under standard test conditions.

ECOLABELS

- A VOLUNTARY scheme currently applies to washing machines, refrigerators, lightbulbs and a variety of household goods.
- They show that the product has passed tests which relate to its key impacts on the environment, including energy use.



Energy labelling will help you choose appliances that use less energy

IMPORTANT NOTES

- Look for the arrows – 'A' is best (most energy efficient).
- The actual amount of electricity used will depend on how the appliance is used (for example, how full the fridge or freezer is) or where it is located (for example, cold appliances use more electricity when sited near cookers or heaters).

D

Action sheet

Copy this page if necessary

Possible measures to consider (transfer from *Record sheet*)	Cost (£)	Payback (years)	Chosen measures	Comments on chosen measures
Cavity wall insulation			☐	
Solid wall insulation			☐	
Roof insulation	350	5	✔	Example – Click to remove data
Floor insulation			☐	
Wet central heating system			☐	
Other heating system			☐	
Hot water system			☐	
Heating and hot water controls			☐	
Draughtstripping			☐	
Ventilation control			☐	
Double glazing			☐	
Low energy lighting			☐	
Low energy appliances			☐	

PREPARED BY

Name

F Smith

Company

ACME

Telephone

0171 645 3456

Type of business

Builder

CUSTOMER:

Name

A Jones

Address

Dunromin

West St

Conway

Gwyneth

USEFUL CONTACTS

CONTACTS

Note on the left useful contacts (and telephone numbers) on grants (page 42) and energy efficiency (page 43).

BRECSU PUBLICATIONS

For trade and technical users (see p44)

Tel: 01923 664258

DOE PUBLICATIONS

For the public (see p44)

Tel: 0345 868686

PUBLICATIONS

Note on the left any useful publications (page 44) under the appropriate source

Grants

HEES (Home Energy Efficiency Scheme)

Grants available for:

- draughtstripping
- loft insulation top-up.

Eligibility:

- pensioners
- low income households on passport benefits.

Contact EAGA (Energy Action Grants Agency)
Freepost, PO Box 1NG Newcastle upon Tyne NE99 2RP
Tel: 0800 181 667

Local council

Local councils offer a variety of grants, such as:

- Renovation Grants (vary from council to council)
- the 'Staying Put' grants for over 60-year-olds.

It may be worth noting below what your local council is offering so that you can tell your customer. Contact the environmental health, housing or planning departments at the council.

LOCAL COUNCIL GRANTS

Council (name) _____

Address: _____

Grants available: _____

Contact: _____

Energy Saving Trust (EST)

The EST runs schemes at different times of the year. Cashback schemes have been offered on:

- condensing boilers
- heating controls
- cavity wall insulation.

For latest information Tel 0171 931 8401.

In 1996 there was also a Budget Heating scheme for low income households on passport benefits with an open fire: the fire is replaced, free of charge, with a focal point fire in the major living room and a fanned storage heater.

Pensioners on benefit also receive a non-fanned storage heater for the hall. For information ring: EAGA 0800 181 667

Grants are available for improving energy efficiency

IMPORTANT NOTES

Many grants are offered only to particular categories of people, such as pensioners or those on low incomes. Information on grants changes rapidly and should be updated as often as possible.

E

Contacts

WALL INSULATION

National Cavity Insulation Association PO Box 12, Haslemere, Surrey GU27 3AH. Tel 01428 654011

CIGA (Cavity Insulation Guarantee Agency) 39 High Street, Redbourn, Herts AL3 7LW Tel 01582 792283

Eurisol, UK Mineral Wool Association (for insulation in general), 39 High Street, Redbourn, Herts AL3 7LW. Tel 01582 794624

Expanded Polystyrene Cavity Insulation Association PO Box 8817, London SW1 XZD Tel 01724 847844

Cavity Foam Bureau PO Box 79, Oldbury, Warley, W. Midlands B69 4PW. Tel 0121 544 4949

External Wall Insulation Association PO Box 12, Haslemere, Surrey GU27 3AH Tel 01428 654011

LOFT, TANKS AND PIPES INSULATION

National Association of Loft Insulation Contractors PO Box 12, Haslemere, Surrey GU27 3AH Tel 01428 654011

DRAUGHTSTRIPPING AND VENTILATION

Draught Proofing Advisory Association PO Box 12, Haslemere, Surrey GU27 3AH. Tel 01428 654011

CONTROLS AND HEATING SYSTEMS

CORGI (Council of Registered Gas Installers) 1 Elmwood, Chineham Business Park, Basingstoke RG24 8WG. Tel 01256 372200

Heating & Ventilating Contractors' Association , ESCA House, 34 Palace Court, London W2 4JG Tel 0171 229 2488. For list of installers, Tel 0345 581 158

Institute of Domestic Heating & Environmental Engineers 37a High Rd, Benfleet, Essex SS7 5LH (Trade enquiries ONLY.) Tel 01268 754266

The Institute of Plumbing 64 Station Lane, Hornchurch, Essex RM12 6NB. Tel 01708 472791

National Association of Plumbing, Heating & Mechanical Service Contractors Ensign House, Ensign Business Centre, Westwood Way, Coventry CV4 8JA. Tel 01203 470626. Fax 01203 470942

Scottish & N. Ireland Plumbing Employers Federation, 2 Walker St, Edinburgh EH3 7LB Tel 0131 225 2255

Society of British Gas Industries 30 Holly Walk, Leamington Spa CV32 4LY. Tel 01926 334357

TACMA (Association of Control Manufacturers) Westminster Tower, 3 Albert Embankment, London SE1 7SL. Tel 0171 793 3008

Solid Fuel Association The Old School House, Church Street, Sutton-in-Ashfield, Nottinghamshire NG17 1AE. Tel 01623 550411

OFTEC (Oil Firing Technical Association for Petroleum Industry) Century House, 100 High St, Banstead, Surrey, SM7 2NN. Tel 01737 373553

Electricity Association Energy & Environment Group, 30 Millbank, London SW1P 4RD Tel 0171 963 5788 Fax 0171 963 5957

GLAZING

Glass & Glazing Federation 44-48 Borough High St, London SE1 1XB. Tel 0171 403 7177

LIGHTING

Lighting Industry Federation Swan House, 270 Balham High Rd., London SW17 7BQ (Trade enquiries only). Tel 0181 675 5432

LABELLING

Association of Manufacturers of Domestic Electrical Appliances (AMDEA) Rapier House, 40-46 Lambs Conduit Street, London WC1N 3NW

GENERAL

Builders Merchants Federation 15 Soho Square London W1V 6HL. (Can supply list of its members in your area.) Tel 0171 439 1753

GOVERNMENTAL

Energy Efficiency Advice Centre Tel (free phone) 0800 512012

Energy Saving Trust 11-12 Buckingham Gate, London SW1E 5LB. Tel 0171 931 8401

Energy Efficiency campaign consumer hotline Tel 0345 277 200

Bibliography

Further information on general and specific energy efficiency measures, and related promotions, may be obtained by members of the public from the DOE, Tel 0345 868686 and from the Energy Efficiency Advice Centre Tel (free phone) 0800 512012.

The Department of the Environment's Energy Efficiency Best Practice programme provides a range of publications and information for technical and trade users. Contact the BRECSU Enquiries Bureau (details below).

BEST PRACTICE PROGRAMME PUBLICATIONS

Good Practice Guides

9 Ground floor insulation in existing housing – a practical guide for specifiers

12 Pitched roof insulation in existing housing – a practical guide for specifiers

16 Guide for installers of condensing boilers in commercial buildings

26 Cavity wall insulation in existing housing

79 Energy efficiency in new housing. Low energy design for housing associations

138 Internal wall insulation in existing housing - a guide for specifiers and contractors

139 Draughtstripping of existing doors and windows

143 Upgrading controls in domestic wet central heating systems – a guide for installers

155 Energy efficient refurbishment of existing housing

174 Minimising thermal bridging in new dwellings

175 Energy efficient refurbishment of low rise cavity wall housing

199 Energy efficient lighting – a guide for installers

General Information Leaflets

9 Domestic ventilation

23 Cavity wall insulation: unlocking the potential in existing dwellings

Good Practice Case Studies

63 Cavity wall insulation in existing dwellings – mineral wool insulation

64 Cavity wall insulation in existing dwellings – polystyrene bead insulation

66 Cavity wall insulation in existing dwellings – Urea Formaldehyde Foam

E

The Department of the Environment's Energy Efficiency Best Practice programme provides impartial, authoritative information on energy efficiency techniques and technologies in industry and buildings. This information is disseminated through publications, videos and software, together with seminars, workshops and other events. Publications within the Best Practice programme are shown opposite.

For further information on:

Buildings-related projects contact:
Enquiries Bureau

BRECSU
Building Research Establishment
Garston, Watford, WD2 7JR
Tel 01923 664258
Fax 01923 664787
E-mail brecsuenq@bre.co.uk

Industrial projects contact:
Energy Efficiency Enquiries Bureau

ETSU
Harwell, Oxfordshire
OX11 0RA
Tel 01235 436747
Fax 01235 433066
E-mail etsuenq@aeat.co.uk

Internet **BRECSU** – http://www.bre.co.uk/bre/otherprg/eebp/default.html
Internet **ETSU** – http://www.etsu.com/eebpp/home.htm

Energy Consumption Guides: compare energy use in specific processes, operations, plant and building types.

Good Practice: promotes proven energy efficient techniques through Guides and Case Studies.

New Practice: monitors first commercial applications of new energy efficiency measures.

Future Practice: reports on joint R&D ventures into new energy efficiency measures.

General Information: describes concepts and approaches yet to be fully established as good practice.

Fuel Efficiency Booklets: give detailed information on specific technologies and techniques.

Introduction to Energy Efficiency: helps new energy managers understand the use and costs of heating, lighting etc.

Record sheet

OPPORTUNITIES AND POSSIBLE MEASURES

Copy this page if necessary

Energy efficiency measures	Potential measures (tick from pages 4 and 5)	Details of potential measures (page)	Brief details of the client's home and its services (fill in details if known)		Possible measures to consider (tick possible measures, taking into account the details of the home)	
Wall insulation		12	Cavity wall		**Cavity wall insulation**	
			Solid wall		**Solid wall insulation**	
			Timber frame wall		NONE – will already be well insulated	
Roof insulation		**16**	Existing insulation thickness	mm	**Roof insulation**	mm
Floor insulation		**20**	Solid floor		**Floor insulation**	
			Floorboards			
Heating system		**22**	Wet central system – age of system	yrs	**Wet central heating system**	
			Other system		**Other heating system**	
			Fuel used			
Hot water system		**26**	From central heating		**Hot water system**	
			Independent			
Controls		**28**	Time and temperature controls		**Heating and hot water controls**	
Draughtstripping		**30**	To all external doors		**Draughtstripping**	
			To all windows			
Controlled ventilation		**32**	Extract fan in kitchen		**Ventilation control**	
			Extract fan in bathroom			
Double glazing		**36**	Double glazed windows with sealed units		**Double glazing**	
			Secondary double glazing			
Efficient lighting		**38**	Fluorescent light in kitchen		**Low energy lighting**	
			Low energy lamps in other rooms			
Appliance labelling		**40**	All appliances are low energy models		**Low energy appliances**	

TYPE 1	Detached house or Bungalow	☐	(see page 7)
TYPE 2	Semi-detached house or End-of-terrace	☐	
TYPE 3	Mid-terraced house	☐	
TYPE 4	Flat	☐	

Action sheet

Copy this page if necessary

Possible measures to consider (transfer from *Record sheet*)	Cost (£)	Payback (years)	Chosen measures	Comments on chosen measures
Cavity wall insulation				
Solid wall insulation				
Roof insulation				
Floor insulation				
Wet central heating system				
Other heating system				
Hot water system				
Heating and hot water controls				
Draughtstripping				
Ventilation control				
Double glazing				
Low energy lighting				
Low energy appliances				

PREPARED BY

Name

Company

Telephone

Type of business

CUSTOMER:

Name

Address

USEFUL CONTACTS

CONTACTS

Note on the left useful contacts (and telephone numbers) on grants (page 42) and energy efficiency (page 43).

BRECSU PUBLICATIONS

For trade and technical users (see p44)

Tel: 01923 664258

DOE PUBLICATIONS

For the public (see p44)

Tel: 0345 868686

PUBLICATIONS

Note on the left any useful publications (page 44) under the appropriate source

Opportunity grid

Energy efficiency measures	Wall insulation	Roof insulation	Floor insulation	Heating system	Hot water system	Controls	Draught-stripping	Ventilation control	Double glazing	Energy Efficient lighting	Appliance labelling
Details on page	12	16	20	22	26	28	30	32	36	38	40
Moving into a new home	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Extension	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
Loft conversion		✓		✓	✓	✓		✓	✓	✓	
Nursery	✓	✓		✓		✓	✓	✓	✓	✓	
New kitchen	✓		✓	✓	✓	✓	✓	✓		✓	✓
New bathroom	✓			✓	✓	✓	✓	✓			
New heating	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Conservatory	✓		✓				✓	✓	✓		
Re-roofing		✓						✓			
Replacement windows							✓	✓	✓		
Re-wiring		✓	✓	✓	✓	✓	✓			✓	
Re-flooring			✓	✓			✓	✓			
Replacement boiler				✓	✓	✓	✓	✓			
Redecorating	✓						✓	✓	✓	✓	
Re-rendering externally	✓								✓		
High fuel bills	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Poor heating	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Insufficient hot water				✓	✓	✓					
Cold rooms	✓	✓	✓	✓		✓	✓	✓	✓		
Too draughty							✓	✓	✓		
Too stuffy						✓		✓			
Musty rooms	✓	✓	✓	✓		✓	✓	✓			
Condensation	✓	✓	✓	✓		✓	✓	✓	✓		
Penetrating/ rising damp	✓		✓				✓	✓			
Burst pipes and leaks		✓	✓	✓	✓	✓	✓				
Wet or dry rot	✓	✓	✓				✓	✓			
Rotten windows							✓	✓	✓		
Noise							✓	✓	✓		

PRINTER: Please trim to 200 mm width